Allen-Bradley

PowerFlex™ Communications

Remote I/O Adapter

20COMM-R
FRN 1.xxx

User Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. "*Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls*" (Publication SGI-1.1) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will the Allen-Bradley Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, the Allen-Bradley Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Allen-Bradley Company with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

Important: Identifies information that is especially important for successful application and understanding of the product.

Shock Hazard labels may be located on or inside the drive to alert people that dangerous voltage may be present.

The information below summarizes the changes to this documentation since its last release. The following changes were made:

Location	Description of Changes
5-2	Status Information and Data or Padding added to the list of Block Transfer Read messages.
	(20 word BTW length) added under Word 19
	(30 word BTW length) added under Word 29
	(60 word BTW length) added under Word 59
	Refer to page 5-4 for a description of each word in a Block Transfer Read used for receiving an Explicit Message Response.
5-3	Word 0 Description changed to read: The least significant byte contains the length of the Explicit Message. The most significant byte is always zero. This is the length of the actual message in bytes, not the size of the BTW in words. This length excludes the two bytes of word 0, but includes words 1 and 2, and all of the data in the main body of the message to be sent. If using a scattered read or write with class code 0x93, the length includes the zero(es) after the last parameter as place holders. See pages C-11 - C-15.
5-4	Word 0 Description change.
	Word 1 Description change.
	Word 2 added to table. Description partially borrowed from Word 1 and enhanced.
	Datafield Word 2 - 19 changed to Word 3 - 19.
5-7	Offset 2 added to Response Data for Read of Drive Parameter 1 (hex)
	Offset 2 added to Response Data for Write of Drive Parameter 41 (hex)
5-9	N13:2 added to Response Data for Read for Drive Parameter 1 (hex)
	N13:2 added to Response Data for Write of Drive Parameter 41 (hex)
5-10	The word length used in the BTW and BTR must be equal to 20, 30 or 60. It must also be greater than or equal to the byte length used in word 0 of the messages converted to words (1 word = 2 bytes).
6-4	If this diagnostic item is any value other than 1, the values of items 7 through 14 (Datalink A1 In - Datalink D2 In), are not actually being transferred to the host.
6-7	Events 23-27 consolidated; “Reserved” description.
5-11	N13:112 added to Response and Control Data for Read of Drive Parameter 1 (hex)
	N13:112 added to Response and Control Data for Write of Drive Parameter 41 (hex)
C-10	Footnote added: 0x4B(1) 0x4C(1) (1)Must be directed to instance 0 and attribute 0.
C-11	Status Information added to Response (Read Data) column. 20 Word BT added 30 Word BT added

Location	Description of Changes
C-12	Request (Write Data) and Response (Read Data) columns shifted down by 1. 60 Word BT added
C-13	N30:72 added to Response Data for Get_Attributes_Scattered. Column incremented by 1.
C-14	Status Information added to Response (Read Data) column. 20 Word BT added. 30 Word BT added.
C-15	Request (Write Data) and Response (Read Data) columns shifted down by 1. 60 Word BT added
C-16	N30:72 added to Response Data for Set_Attributes_Scattered. Column incremented by 1.

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Notes:

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Related Documentation

For:	Refer to:	Publication
DriveExplorer™	Getting Results with DriveExplorer Manual Online help (installed with the software)	9306-5.2
DriveTools 2000™	http://www.ab.com/drives/drivetools_2000	
DriveTools32™	Getting Results with DriveTools32 Manual Online help (installed with the software)	9303-5.23
Electrostatic Discharge	*Guarding Against Electrostatic Damage*	8000-4.5.2
HIM	*HIM Quick Reference*	20HIM-QR001…
PowerFlex™ 70 Drive	*PowerFlex 70 User Manual* *PowerFlex 70 Reference Manual*	20A-UM001… 20A-RM001…
PowerFlex 700 Drive	*PowerFlex 700 User Manual* *PowerFlex 700 Reference Manual*	20B-UM001… 20B-RM001…
RSLinx™	*Getting Results with RSLinx* Online help (installed with the software)	9399-WAB32GR
RSLogix™ 5	*RSLogix 5 Getting Results Guide* Online help (installed with the software)	9399-RL53GR
RSLogix 500	*RSLogix 500 Getting Results Guide* Online help (installed with the software)	9399-RL50GR
RSLogix 5000	*RSLogix 5000 Getting Results Guide* Online help (installed with the software)	9399-RLD300GR

Documentation can be obtained online at http://www.ab.com/manuals

Conventions Used in this Manual

The following conventions are used throughout this manual:

- Parameters are shown in the following format **Parameter xxx - [*]**. The xxx represents the parameter number. The * represents the parameter name.
- Menu commands are shown in bold type face and follow the format **Menu > Command**. For example, if you read "Select **File > Open**," you should click the **File** menu and then click the **Open** command.
- The firmware release is displayed as FRN X.xxx. The "FRN" signifies Firmware Release Number. The "X" is the major release number. The "xxx" is the minor update number. This manual is for firmware release 1.xxx.
- This manual provides information about the Remote I/O adapter and using it with PowerFlex drives. The adapter can be used with other products that implement DPI™. Refer to the documentation for your product for specific information about how it works with the adapter.

Rockwell Automation Support

Rockwell Automation offers support services worldwide, with over 75 sales/support offices, over 500 authorized distributors, and over 250 authorized systems integrators located through the United States alone. In addition, Rockwell Automation representatives are in every major country in the world.

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Contact your local Rockwell Automation representative for sales and order support, product technical training, warranty support, and support service agreements.

Technical Product Assistance

If you need to contact Rockwell Automation for technical assistance, please review the information in Chapter 6, Troubleshooting, first. If you still have problems, then call your local Rockwell Automation representative.

Getting Started

The 20-COMM-R Remote I/O adapter is an embedded communication option for any one drive in the PowerFlex family. It can also be used with other Allen-Bradley products implementing DPI™, a functional enhancement to SCANport™.

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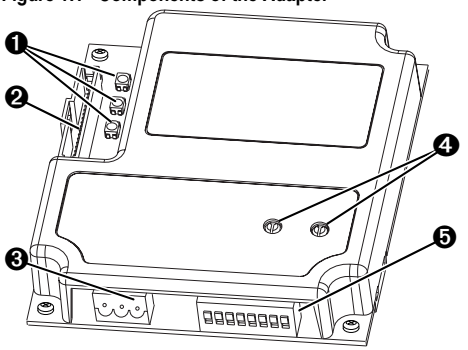
Components

Figure 1.1 Components of the Adapter



Number	Part	Description
❶	Status Indicators	Three LEDs that indicate the status of the connected drive, adapter, and network. Refer to Chapter 6, Troubleshooting.
❷	DPI Connector	A 20-pin, single-row shrouded male header. An Internal Interface cable is connected to this connector and a connector on the drive.
❸	Remote I/O Connector	A standard 3-pin Remote I/O connector.
❹	Node Address Switches	Switches for setting the rack address. Refer to Chapter 2, Installing the Adapter.
❺	Configuration Switches	Switches for setting the starting module group, last rack, rack size and baud rate. Refer to Chapter 2, Installing the Adapter.

Features

The Remote I/O adapter features the following:

- The adapter is mounted in the PowerFlex drive. It receives the required power from the drive.
- Switches let you configure the module, including a rack address and network baud rate, before applying power to the drive. Alternatively, you can disable the switches and use parameters to configure the adapter by setting DIP switches 7 and 8 to “1” (see Commissioning the Adapter in Chapter 2).
- Captive screws are used to secure and ground the adapter to the drive.
- A number of configuration tools can be used to configure the adapter and connected drive. Tools include the PowerFlex HIM (Human Interface Module) on the drive or drive configuration software such as DriveTools 2000 (version 1.01 or greater) or DriveExplorer (version 2.01 or greater).
- I/O is supported. You can configure the adapter to use either 1/4 rack (two 16-bit words) or 1/2 rack (four 16-bit words) of discrete I/O. In addition, up to eighteen 16-bit words of I/O can be transferred using the Block Transfer I/O image without increasing the size of your discrete I/O rack. The Block Transfer I/O image includes Datalinks. Refer to Chapter 4, Using Discrete & Block Transfer I/O for more information.
- Block Transfer messaging is supported. You can configure and monitor the drive using Block Transfer messaging.
- User-defined fault actions let you determine how the adapter and PowerFlex drive respond to communication disruptions on the network and controllers in idle mode.

Compatible Products

The Remote I/O adapter is compatible with Allen-Bradley PowerFlex drives and other products that support DPI. DPI is a second generation peripheral communication interface and is a functional enhancement to SCANport. At the time of publication, compatible products include:

- PowerFlex 70 drives
- PowerFlex 700 drives
- PowerFlex 7000 drives

Required Equipment

Equipment Shipped with the Adapter

When you unpack the adapter, verify that the package includes:

- ❑ One Remote I/O adapter
- ❑ One 2.54 cm (1 in.) and one 15.24 cm (6 in.) Internal Interface cable (only one cable is needed to connect the adapter to the drive)
- ❑ One three-pin Remote I/O plug (connected to the Remote I/O connector on the adapter)
- ❑ One grounding wrist strap
- ❑ One 82 ohm and one 150 ohm termination resistor
- ❑ This manual

User-Supplied Equipment

To install and configure the Remote I/O adapter, you must supply:

- ❑ A small flathead or Phillips screwdriver
- ❑ Remote I/O cable
- ❑ Drive configuration tool, such as a PowerFlex HIM, DriveTools 2000 (version 1.01 or greater), or DriveExplorer (version 2.01 or greater), if you need to configure parameters
- ❑ Controller configuration software such as RSLogix5, RSLogix500, or RSLogix5000

Safety Precautions

Please read the following safety precautions carefully.

ATTENTION: Risk of injury or equipment damage exists. Only personnel familiar with drive and power products and the associated machinery should plan or implement the installation, start-up, configuration, and subsequent maintenance of the product using a Remote I/O adapter. Failure to comply may result in injury and/or equipment damage.

ATTENTION: Risk of injury or death exists. The PowerFlex drive may contain high voltages that can cause injury or death. Remove all power from the PowerFlex drive, and then verify power has been removed before installing or removing a Remote I/O adapter.

ATTENTION: Risk of injury or equipment damage exists. DPI or SCANport host products must not be directly connected together via 1202 cables. Unpredictable behavior due to timing and other internal procedures can result if two or more devices are connected in this manner.

ATTENTION: Risk of injury or equipment damage exists. If the Remote I/O adapter is transmitting control I/O to the product, the product may fault when you reset the adapter. Determine how your product will respond before resetting an adapter.

ATTENTION: Risk of injury or equipment damage exists. **Parameters 10 - [Comm Flt Action]** and **11 - [Idle Flt Action]** let you determine the action of the adapter and connected PowerFlex drive if communications are disrupted. By default, these parameters fault the drive. You can set these parameters so that the drive continues to run. Precautions should be taken to ensure that the settings of these parameters do not create a hazard of injury or equipment damage.

ATTENTION: Risk of injury or equipment damage exists. When a system is configured for the first time, there may be unintended or incorrect machine motion. Disconnect the motor from the machine or process during initial system testing.

ATTENTION: Risk of injury or equipment damage exists. The examples in this publication are intended solely for purposes of example. There are many variables and requirements with any application. Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use of the examples shown in this publication.

Quick Start

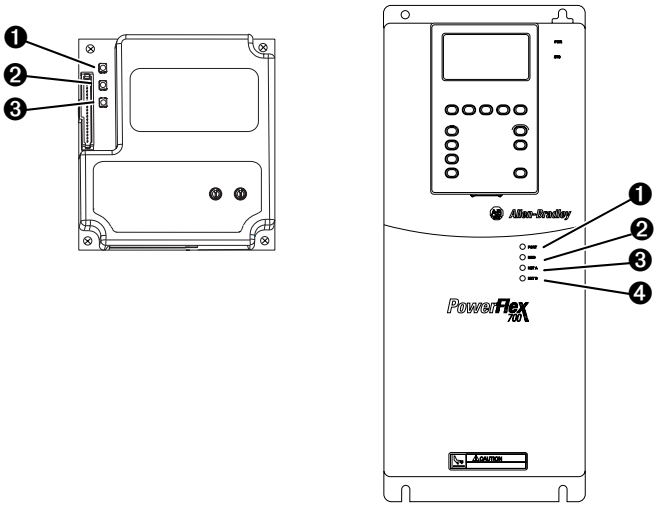
This section is designed to help experienced users configure or set up the Remote I/O adapter. If you are unsure how to complete a step, refer to the referenced chapter.

Step		Refer to
1	**Review the safety precautions for the adapter.**	Throughout This Manual
2	**Verify that the PowerFlex drive is properly installed.**	Drive User Manual
3	**Commission the adapter.** With power removed, set a unique node address on the Remote I/O network using the rotary switches. Set the following using the DIP switches: • Starting remote I/O module group (Switches 1 and 2) • Last rack (Switch 3) • Rack size (Switch 4) • Remote I/O baud rate (Switches 7 and 8) If desired, you can disable the switch settings and use parameter settings instead. To disable switch settings, set DIP switches 7 and 8 both to On. Then, make sure that you configure the parameters after applying power to the adapter.	Chapter 2, Installing the Adapter
4	**Install the adapter.** Verify that the PowerFlex drive is not powered. Then, connect the adapter to the network using a Remote I/O cable and to the drive using the Internal Interface cable. Use the screws to secure and ground the adapter to the drive.	Chapter 2, Installing the Adapter
5	**Apply power to the adapter.** The adapter receives its power from the drive. Apply power to the drive. If the adapter was correctly installed, the status indicators will be green. If a status indicator is red, there is a problem. Refer to Chapter 6, Troubleshooting.	Chapter 2, Installing the Adapter
6	**Configure the adapter for your application.** Set the parameters for the following features as required by your application: • Rack address, starting module group, last rack, rack size, and baud rate (if DIP switches 7 and 8 are both ON) • I/O configuration • Fault actions	Chapter 3, Configuring the Adapter
7	**Create a ladder logic program.** Use a controller programming tool such as RSLogix to create a ladder logic program that enables you to do the following: • Control the adapter and connected product using Discrete I/O and Block Transfer I/O • Monitor or configure the product using Block Transfer Explicit Messages	Chapter 4, Using Discrete & Block Transfer I/O Chapter 5, Using Block Transfer Messaging Chapter 6, Troubleshooting

Modes of Operation

The adapter uses three status indicators to report its operating status. They can be viewed on the adapter or through the drive cover. See Figure 1.2.

Figure 1.2 Status Indicators ***(location on drive may vary)***



#	Status Indicator	Status	Description
❶	PORT	Green	Normal Operation. The adapter is properly connected and is communicating with the PowerFlex drive.
		Flashing Green	The adapter is in the process of establishing an I/O connection to the PowerFlex drive or no I/O connections are configured.
❷	MOD	Green	Normal Operation. The adapter is receiving I/O from the controller.
		Flashing Green	Normal Operation. The adapter is not transferring I/O from the controller to the drive.
❸	NET A	Green	Normal Operation. The adapter is properly connected and is communicating with the controller on the network.
		Flashing Green	The adapter is properly connected, but the controller is resetting, in test mode, in program mode, or not properly configured to communicate with the adapter.
❹	NET B	Off	Not used for Remote I/O.

If status indicators are off, the adapter is not receiving power. Refer to Chapter 2, Installing the Adapter, for installation instructions. If any other conditions occur, refer to Chapter 6, Troubleshooting.

Installing the Adapter

Chapter 2 provides instructions for installing the adapter in a PowerFlex 70 or 700 drive. If you are installing the adapter in a different product, refer to its documentation.

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Preparing for an Installation

Before installing the Remote I/O adapter:

- Verify that you have all required equipment. Refer to Chapter 1, Getting Started.
- Refer to the Glossary in this manual for definitions of the terms in this section.

Selecting Remote I/O Cables

Remote I/O adapters are connected to the Remote I/O network or link with twinaxial cable used for Remote I/O and Data Highway Plus (DH+) communications. When selecting a cable, remember:

- Only 1770-CD Belden #9463 is tested and approved for Remote I/O and DH+ installations. Use other cables at your own risk.
- The maximum cable length depends on the baud rate:

Baud Rate	Maximum Cable Length
57.6 kbps	3,048 m (10,000 ft.)
115.2 kbps	1,524 m (5,000 ft.)
230.4 kbps	762 m (2,500 ft.)

- All three connectors (blue, shield and clear) must be connected at each node.
- Do not use a star topology. Only two cables may be connected at any wiring point. You can use a series topology and daisy-chain two wires at a point.

Commissioning the Adapter

To commission the adapter, set the rotary switches and the DIP switches. Either slide the switches to the desired settings or disable them by sliding SW 7 and SW 8 to On so that parameters are used instead. Refer to the Glossary for definitions of terms in this section.

Important: New settings are recognized only when power is applied to the adapter. If a setting is changed, cycle power or reset the adapter.

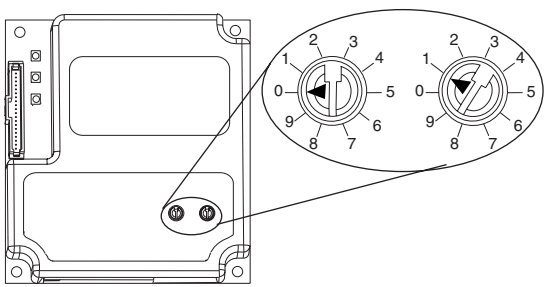
ATTENTION: Risk of equipment damage exists. The Remote I/O adapter contains ESD (Electrostatic Discharge) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the adapter. If you are unfamiliar with static control procedures, refer to *Guarding Against Electrostatic Damage*, Publication 8000-4.5.2.

ATTENTION: Risk of equipment damage exists. Pen ink or pencil lead may damage the switches on the Remote I/O adapter. Do not use a pen or pencil to set the switches.

1. Set a rack address between 00 and 77 Octal. The default is 01. Each Remote I/O device must have a unique rack address that the controller can recognize. Note the following:

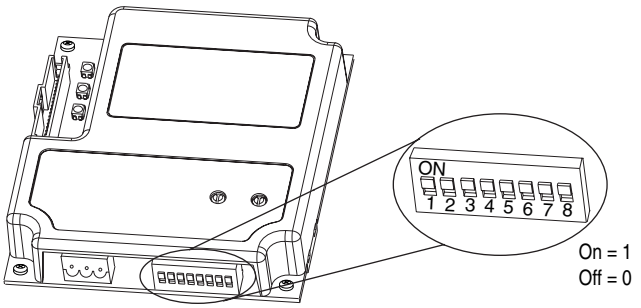
   – Although the adapter supports rack address up to 77 Octal, not all controllers recognize all of the addresses, and a Remote I/O channel can support only 32 devices.
   – If SW 7 and SW 8 are both **On**, the adapter uses the rack address set in **Parameter 3 - [RIO Addr Cfg]**. Refer to Chapter 3, Installing the Adapter.
   – PLC-2 controllers identify rack addresses differently than other controllers. PLC-2 controllers identify the rack address of the adapter as one plus the value of the switch settings.

Figure 2.1 Setting the Rack Address



2. Set the DIP switches using the following illustration and table.

Figure 2.2 Setting the DIP Switches



Switches	Setting		Description
SW 1 and SW 2	1	2	Switches are used together to set the starting module group:
	0	0	Group 0 (Default)
	1	0	Group 2
	0	1	Group 4
	1	1	Group 6 – Only used if SW 4 is set to “0” (1/4 rack).
SW 3	0		Not the last RIO rack (Default)
	1		Last RIO group within the rack
SW 4	0		1/4 rack (Default)
	1		1/2 rack
SW 5	0		Not Used
SW 6	0		Not Used
SW 7 and SW 8	7	8	Switches are used together to set the Remote I/O baud rate:
	0	0	57.6 kbps (Default)
	1	0	115.2 kbps
	0	1	230.4 kbps
	1	1	Disable all hardware switches. The adapter uses the following parameters instead of switches: 3 - [RIO Addr Cfg] for the rack address 5 - [RIO Rate Cfg] for the baud rate 25 - [Start RIO Group] for the starting module group 26 - [Last RIO Rack] for the last physical rack 27 - [Rack Size] for the rack size

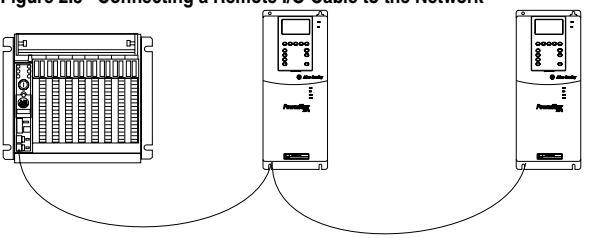
Connecting the Adapter to the Network

ATTENTION: Risk of injury or death exists. The PowerFlex drive may contain high voltages that can cause injury or death. Remove power from the drive, and then verify power has been discharged before installing or removing an adapter.

1. Remove power from the drive.
2. Use static control precautions.
3. Connect a Remote I/O cable to the controller or create a daisy-chain from another device on the Remote I/O network.

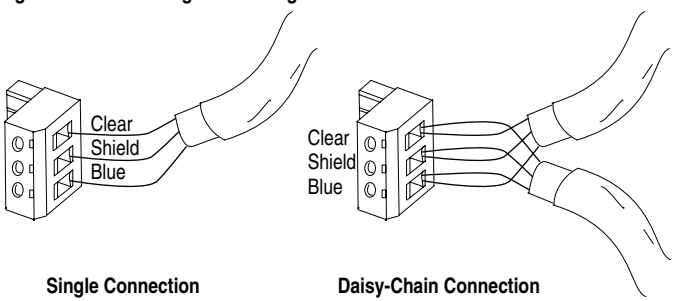
Important: Maximum cable length depends on the Remote I/O baud rate. Refer to the Selecting Remote I/O Cables section in this chapter.

Figure 2.3 Connecting a Remote I/O Cable to the Network



4. Route the Remote I/O cable through the bottom of the PowerFlex drive. (See Figure 2.7.)
5. Connect a 3-Pin Remote I/O plug to the cable.

Figure 2.4 Connecting a 3-Pin Plug to the Cable



Single Connection **Daisy-Chain Connection**

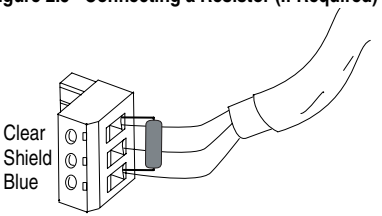
6. If the adapter is at the end of the Remote I/O link, connect a termination resistor. The resistor should have a value of 82 or 150 ohms (82 ohms is preferred).

   Important: If the Remote I/O network is operating at 230.4 kbps, you must use an 82 ohm termination resistor.

   Important: If any of the following products (which cannot operate at 230.4 kbps) are on the Remote I/O network, you must use a 150 ohm termination resistor.

   - 1771-SN scanner
   - 1772-SD scanner
   - 1772-SD2 scanner
   - 1772-SR scanner
   - 1775-S4A scanner
   - 1775-S4B scanner
   - 6008-SQH1 scanner
   - 6008-SQH scanner
   - 1771-AS adapter
   - 1772-ASB (ser. A) adapter
   - 1771-DCM adapter
   - 1771-AF device

Figure 2.5 Connecting a Resistor (If Required)

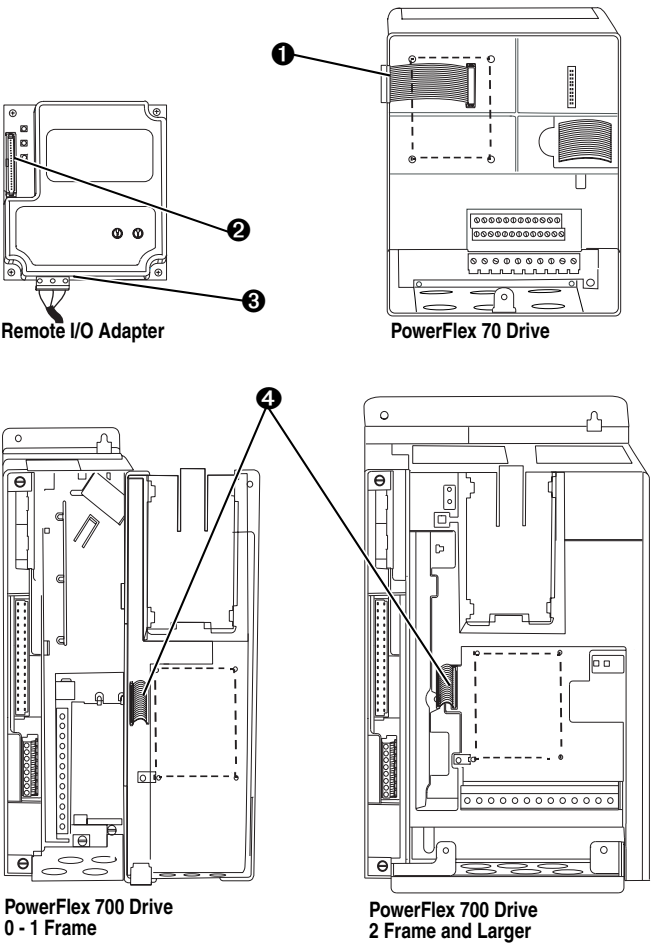


7. Connect the Remote I/O cable to the adapter. (See Figure 2.6.)

Connecting the Adapter to the Drive

1. Remove power from the drive.
2. Use static control precautions.
3. Connect the Internal Interface cable to the DPI port on the drive and then to the DPI connector on the adapter.

Figure 2.6 DPI Ports and Internal Interface Cables



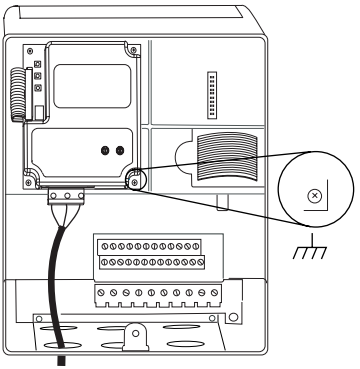
#	Description
❶	15.24 cm (6 in.) Internal Interface cable
❷	DPI Connector

#	Description
❸	Remote I/O cable
❹	2.54 cm (1 in.) Internal Interface cable

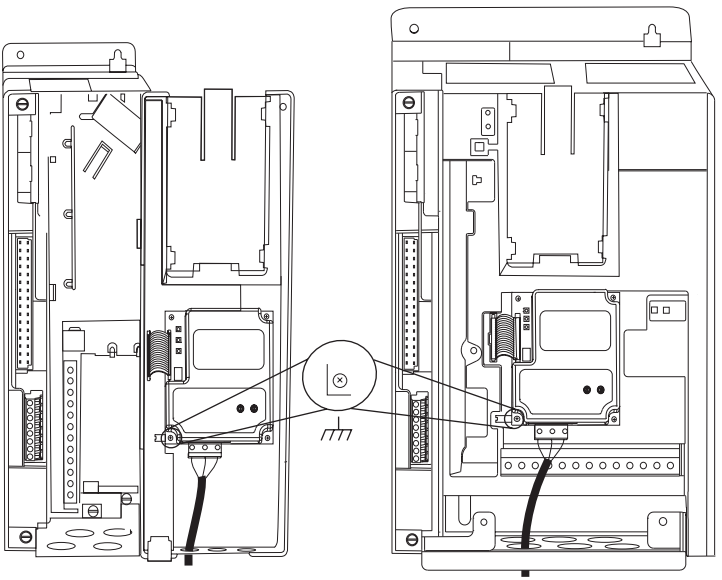
4. On a PowerFlex 70, fold the Internal Interface cable behind the adapter and mount the adapter on the drive using the four captive screws. On a PowerFlex 700, just mount the adapter on the drive using the four captive screws to secure and ground it to the drive.

Important: All screws must be tightened since the adapter is grounded through a screw.

Figure 2.7 Mounting the Adapter



PowerFlex 70 Drive
Adapter mounts in drive.



PowerFlex 700 Drive
(0 - 1 Frames)
Adapter mounts on door.

PowerFlex 700 Drive
(2 Frame and Larger)
Adapter mounts in drive.

Applying Power

ATTENTION: Risk of equipment damage, injury, or death exists. Unpredictable operation may occur if you fail to verify that connections and switch settings are compatible with your application. Verify that connections and parameter settings are compatible with your application before applying power to the drive.

1. Close the door or reinstall the cover on the drive. The status indicators can be viewed on the front of the drive after power has been applied.
2. Apply power to the PowerFlex drive. The adapter receives its power from the connected drive. The status indicators should be green. If a status indicator is red, there is a problem. Refer to Chapter 6, Troubleshooting.
3. If necessary, apply power to the master device (controller) and other Remote I/O devices.

Configuring the Adapter

Chapter 3 provides instructions and information for setting the parameters in the adapter.

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For a list of parameters, refer to Appendix B, Adapter Parameters. For definitions of terms in this chapter, refer to the Glossary.

Configuration Tools

The Remote I/O adapter stores parameters and other information in its own non-volatile memory. You must, therefore, access the adapter to view and edit its parameters. The following tools can be used to access the adapter parameters:

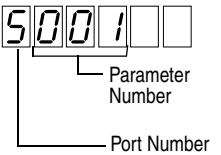
Tool	Refer To:
DriveExplorer (version 2.01 or greater)	*DriveExplorer Getting Results Manual*, Publication 9306-5.3, or the online help
DriveTools 2000 (version 1.01 or greater)	*DriveTools 2000 Online Help*
PowerFlex HIM	page 3-2

You can also use Block Transfer messaging to view and edit parameters in the adapter and drive. Refer to Chapter 6, Troubleshooting.

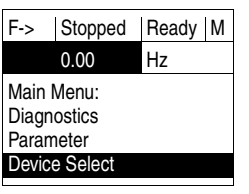
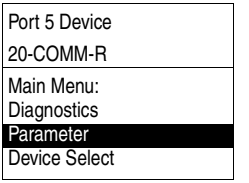
Using the PowerFlex HIM

If your drive has either an LED or LCD HIM (Human Interface Module), access parameters in the Remote I/O adapter as shown below. It is recommended that you read through the steps for your HIM before performing the sequence. For additional HIM information, refer to your PowerFlex Drive User Manual or the HIM Quick Reference card.

Using an LED HIM

Step	Key	Example Screen
1. Press the ALT and then Sel (Device) to display the Device Screen.	Device ALT Sel	
2. Press the Up Arrow or Down Arrow to scroll to the Remote I/O adapter. Letters represent files in the drive, and numbers represent ports. The adapter is connected to port 5.	OR	
3. Press the Enter key to enter your selection. A parameter database is constructed, and then the first parameter is displayed.		
4. Edit the parameters using the same techniques that you use to edit drive parameters.		

Using an LCD HIM

Step	Key	Example Screen
1. Press the Up Arrow or Down Arrow to scroll to **Device Select**.	OR	
2. Press Enter to enter your selection.		
3. Press the Up Arrow or Down Arrow to scroll to the Remote I/O adapter (20-COMM-R).	OR	
4. Press Enter to select the Remote I/O adapter. A parameter database is constructed, and then a menu for the adapter is displayed.		
5. Edit the parameters using the same techniques that you use to edit drive parameters.		

Setting the Rack Address

If the adapter switches are disabled (SW 7 and SW 8 are both On), the value of **Parameter 03 - [RIO Addr Cfg]** determines the rack address. Note the following:

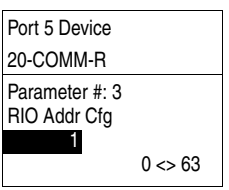
- Although the adapter supports rack addresses up to 77 Octal, not all controllers recognize all of the addresses, and a Remote I/O channel can support only 32 devices.
- PLC-2 controllers identify rack addresses differently than other controllers. PLC-2 controllers identify the rack address of the adapter as one plus the value of the parameter setting.

1. Set the value of **Parameter 03 - [RIO Addr Cfg]** to a rack address. This address is displayed as a decimal value.

   Important: The HIM and software tools (such as Drive Explorer) will display the address as a decimal value.

Decimal	Octal	Decimal	Octal	Decimal	Octal	Decimal	Octal
0	0	16	20	32	40	48	60
1	1 (Default)	17	21	33	41	49	61
2	2	18	22	34	42	50	62
3	3	19	23	35	43	51	63
4	4	20	24	36	44	52	64
5	5	21	25	37	45	53	65
6	6	22	26	38	46	54	66
7	7	23	27	39	47	55	67
8	10	24	30	40	50	56	70
9	11	25	31	41	51	57	71
10	12	26	32	42	52	58	72
11	13	27	33	43	53	59	73
12	14	28	34	44	54	60	74
13	15	29	35	45	55	61	75
14	16	30	36	46	56	62	76
15	17	31	37	47	57	63	77

Figure 3.1 Rack Address Screen on an LCD HIM



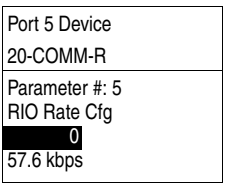
2. Reset the adapter. Refer to the Resetting the Adapter section in this chapter.

Setting the Baud Rate

If the adapter switches are disabled (SW 7 and SW 8 are both On), the value of **Parameter 05 - [RIO Rate Cfg]** determines the Remote I/O baud rate.

1. Set the value of **Parameter 05 - [RIO Rate Cfg]** to the baud rate at which your network is operating.

Figure 3.2 RIO Data Rate Configuration Screen on an LCD HIM



Value	Baud Rate
0	57.6 kbps (Default)
1	115.2 kbps
2	230.4 kbps

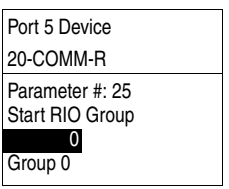
2. Reset the adapter. Refer to the Resetting the Adapter section in this chapter.

Setting the Starting Module Group

If the adapter switches are disabled (SW 7 and SW 8 are both On), the value of **Parameter 25 - [Start RIO Group]** determines the starting module group.

1. Set **Parameter 25 - [Start RIO Group]** to the desired starting group.

Figure 3.3 Start RIO Group Screen on an LCD HIM



Value	Starting Module Group
0	Group 0 (Default)
1	Group 2
2	Group 4
3	Group 6 Do not use if the adapter uses a 1/2 rack or an error will result.

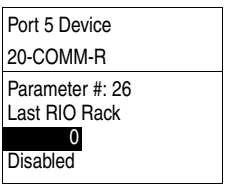
2. Reset the adapter. Refer to the Resetting the Adapter section in this chapter.

Setting the Last Rack

If the adapter switches are disabled (SW 7 and SW 8 are both On), the value of **Parameter 26 - [Last RIO Rack]** notifies a controller that this device is the last device on a specified rack. This parameter must be set to **Enabled** if a product is the last device on a rack address that uses a PLC-2 controller. We recommend that you set this parameter to **Enabled** whenever a device is the last device on a rack.

1. Set **Parameter 26 - [Last RIO Rack]** to the desired state.

Figure 3.4 Last RIO Rack Screen on an LCD HIM



Value	Last Rack
0	Disabled (Default)
1	Enabled

2. Reset the adapter. Refer to the Resetting the Adapter section in this chapter.

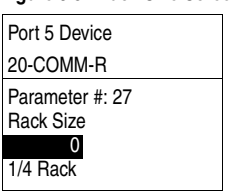
Setting the Rack Size

If the adapter switches are disabled (SW 7 and SW 8 are both On), the value of **Parameter 27 - [Rack Size]** determines the rack size. With the Remote I/O adapter, you can use 1/4 or 1/2 rack. This I/O is the discrete I/O. Refer to Chapter 4, Using Discrete & Block Transfer I/O, for more information about using I/O.

TIP: Additional I/O, such as Reference/Feedback and Datalinks, can be transmitted using the Block Transfer I/O Image.

1. Set **Parameter 27 - [Rack Size]** to the size required by your application.

Figure 3.5 Rack Size Screen on an LCD HIM



Value	Rack Size
0	1/4 (Default)
1	1/2

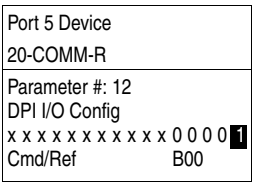
2. Reset the adapter. Refer to the Resetting the Adapter section in this chapter.

Setting the I/O Configuration

The setting of **Parameter 12 - [DPI I/O Config]** determines the type of data sent to the drive as I/O. Logic Command/Logic Status, Reference/Feedback, and Datalinks can be enabled or disabled. Refer to Chapter 4, Using Discrete & Block Transfer I/O, for more information about using I/O.

1. Set the bits in **Parameter 12 - [DPI I/O Config]**:

Figure 3.6 DPI I/O Configuration Screen on an LCD HIM



Bit	Description
0	Logic Command/Reference (Default)
1	Datalink A
2	Datalink B
3	Datalink C
4	Datalink D
5 - 16	Not Used

A “1” enables the I/O.
A “0” disables the I/O.

2. If you enabled Logic Command/Reference, configure the required parameters in the drive to accept the logic and Reference from the adapter.

   For example, set **Parameter 90 - [Speed Ref A Sel]** in a PowerFlex 70 or 700 drive to “DPI Port 5” so that the drive uses the Reference from the adapter. Also, verify that the mask parameters (for example, **Parameter 276 - [Logic Mask]**) in the drive are configured to receive the desired logic from the adapter.

3. If you enabled one or more Datalinks, configure parameters in the drive to determine the source and destination of data in the Datalink(s). Also, ensure that the Remote I/O adapter is the only adapter using the enabled Datalink(s).

4. Reset the adapter. Refer to the Resetting the Adapter section in this chapter.

Setting a Fault Action

By default, when communications are disrupted (for example, a cable is disconnected) or the scanner is idle (for example, PLC in Program mode), the drive responds by faulting if it is using I/O from the network. You can configure a different response to communication disruptions using **Parameter 10 - [Comm Flt Action]** and a different response to an idle scanner using **Parameter 11 - [Idle Flt Action]**.

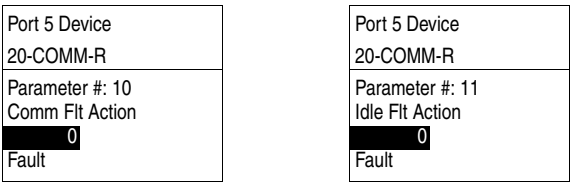
ATTENTION: Risk of injury or equipment damage exists. **Parameters 10 - [Comm Flt Action]** and **11 - [Idle Flt Action]** let you determine the action of the adapter and connected drive if communications are disrupted or the scanner is idle. By default, these parameters fault the drive. You can set these parameters so that the drive continues to run. Precautions should be taken to ensure that the settings of these parameters do not create a hazard of injury or equipment damage.

To change the fault action

- Set the value of **Parameters 10 - [Comm Flt Action]** and **11 - [Idle Flt Action]** to the desired responses:

Value	Action	Description
0	Fault	The drive is faulted. (Default)
1	Stop	The drive is stopped but not faulted.
2	Zero data	The drive is sent 0 for output data. This does not command a stop.
3	Hold last	The drive continues in its present state after a communications disruption.
4	Send Flt Cfg	The drive is sent the data that you set in the fault configuration parameters. The fault configuration parameters start with Parameter 14 - [Flt Cfg Logic] and end with 23 - [Flt Cfg D2 In].

Figure 3.7 Fault Action Screens on an LCD HIM



Changes to these parameters take effect immediately. A reset is not required.

To set the fault configuration parameters

If you set either **Parameter 10 - [Comm Flt Action]** or **11 - [Idle Flt Action]** to the "Send Flt Cfg," the values in the following parameters are sent to the drive after a communications fault and/or idle fault occurs. You must set these parameters to values required by your application.

Parameter	Name	Description
14	Flt Cfg Logic	A 16-bit value sent to the drive for Logic Command. The bit definitions will depend on the product to which the adapter is connected.
15	Flt Cfg Ref	A 32-bit value (0 – 4294967295) sent to the drive as a Reference or Datalink. **Important:** If the drive uses a 16-bit Reference or 16-bit Datalinks, the most significant word of the value must be set to zero (0) or a fault will occur.
16 – 23	Flt Cfg x1 In	

Changes to these parameters take effect immediately. A reset is not required.

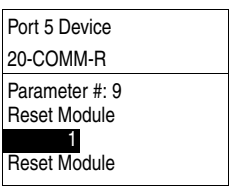
Resetting the Adapter

Changes to switch settings or some parameters (numbers: 3, 5, 12, 25, 26, and 27) require that you reset the adapter before the new settings take effect. You can reset the adapter by cycling power to the drive or by using the following parameter:

ATTENTION: Risk of injury or equipment damage exists. If the adapter is transmitting control I/O to the drive, the drive may fault when you reset the adapter. Determine how your drive will respond before resetting a connected adapter.

- Set the **Parameter 09 - [Reset Module]** to **Reset Module**:

Figure 3.8 Reset Screen on an LCD HIM

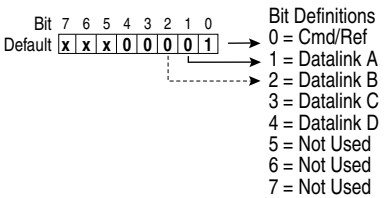


Bit	Description
0	Ready (Default)
1	Reset Module
2	Set Defaults

When you enter **1 = Reset Module**, the adapter will be immediately reset. When you enter **2 = Set Defaults**, the adapter will set all adapter parameters to their factory-default settings, but not reset. The value of this parameter will be restored to **0 = Ready** after the adapter is reset or defaults are restored.

Viewing the Adapter Configuration

The following parameters provide information about how the adapter is configured and can be viewed at any time.

Number	Name	Description
1	DPI Port	The port on the drive to which the adapter is connected. Usually, it is port 5.
2	DPI Data Rate	The data rate used by DPI in the drive. It will be either 125 kbps or 500 kbps. It is set using a parameter in the drive, and the adapter autobauds to the set DPI data rate.
4	RIO Addr Actual	The rack address used by the adapter. This will be one of the following values: • The address set by the rotary switches. • The value of Parameter 3 - [RIO Addr Cfg] if the switches have been disabled. • An old address of the switches or parameter if they have been changed and the adapter has not been reset.
6	RIO Rate Actual	The baud rate used by the adapter. This will be one of the following values: • The baud rate set by the DIP switches 7 and 8. • The value of Parameter 5 - [RIO Rate Cfg] if the switches have been disabled. • An old baud rate of the switches or parameter if they have been changed and the adapter has not been reset.
7	Ref/Fdbk Size	The size of the Reference/Feedback. It will either be 16 bits or 32 bits. It is set by the drive and the adapter automatically uses the correct size.
8	Datalink Size	The size of the Datalinks. It will either be 16 bits or 32 bits. It is set by the drive and the adapter automatically uses the correct size.
13	DPI I/O Active	The Cmd/Ref and Datalinks used by the adapter. This value is the same as Parameter 12 - [DPI I/O Config] unless the parameter was changed and the adapter was not reset. A “0” indicates the I/O has been disabled. A “1” indicates the I/O has been enabled. 
24	Switches	The status of the switches. By default, switches are “enabled,” and the adapter is configured based on their settings. If both SW 7 and SW 8 are On, switches are “disabled” and the adapter is configured with values in parameters 3, 5, 25, 26, and 27.

Notes:

Using Discrete & Block Transfer I/O

Chapter 4 provides information and examples about using I/O to control a PowerFlex drive.

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About I/O	4-1
Understanding the I/O Image	4-2
Discrete I/O Image	4-4
Block Transfer I/O Image	4-5

Topic	Page
Example Programs	4-8
ControlLogix Example	4-9
PLC Example	4-12
SLC Example	4-14

ATTENTION: Hazard of injury or equipment damage exists. The examples in this publication are intended solely for purposes of example. There are many variables and requirements with any application. Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use of the examples shown in this publication.

About I/O

I/O is used to transfer the data which can control the PowerFlex drive and its speed. It is also used for transmitting data through Datalinks.

The Remote I/O adapter uses discrete I/O and Block Transfer I/O to transfer I/O data. The *discrete I/O* is either 1/4 rack (two 16-bit words) or 1/2 rack (four 16-bit words). The rack size is set using DIP switch 4 or, if switches have been disabled, **Parameter 27 - [Rack Size]**. The *Block Transfer I/O* includes all Block Transfer Read or Block Transfer Write messages that are 18 words or fewer.

The type of I/O that is transmitted between the drive and controller is set in **Parameter 12 - [DPI I/O Config]**. When you set up your I/O, note the following:

- The Logic Command/Status is always transmitted in the discrete I/O.
- The Reference is transmitted in the discrete I/O if you are using a 1/2 rack, or in the Block Transfer I/O if you are using a 1/4 rack.
- Datalinks are always transmitted in the Block Transfer I/O.

Understanding the I/O Image

Figure 4.1 (1/4 rack) and Figure 4.2 (1/2 rack) show how data is transmitted between a controller and drive.

Rack Size	Reference Source	Feedback Destination	Datalinks
1/4	Block Transfer I/O	Block Transfer I/O	Block Transfer I/O
1/2	Discrete I/O	Discrete and Block Transfer I/O	Block Transfer I/O

Figure 4.1 Example I/O Image (1/4 Rack Configuration)

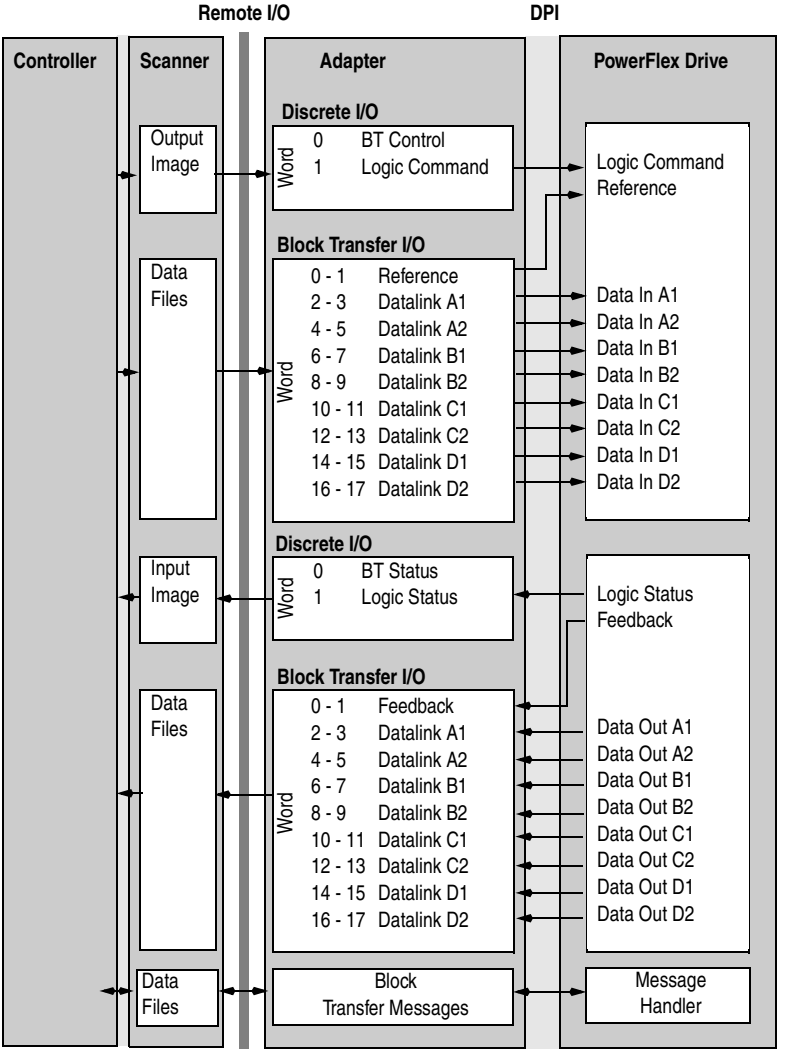
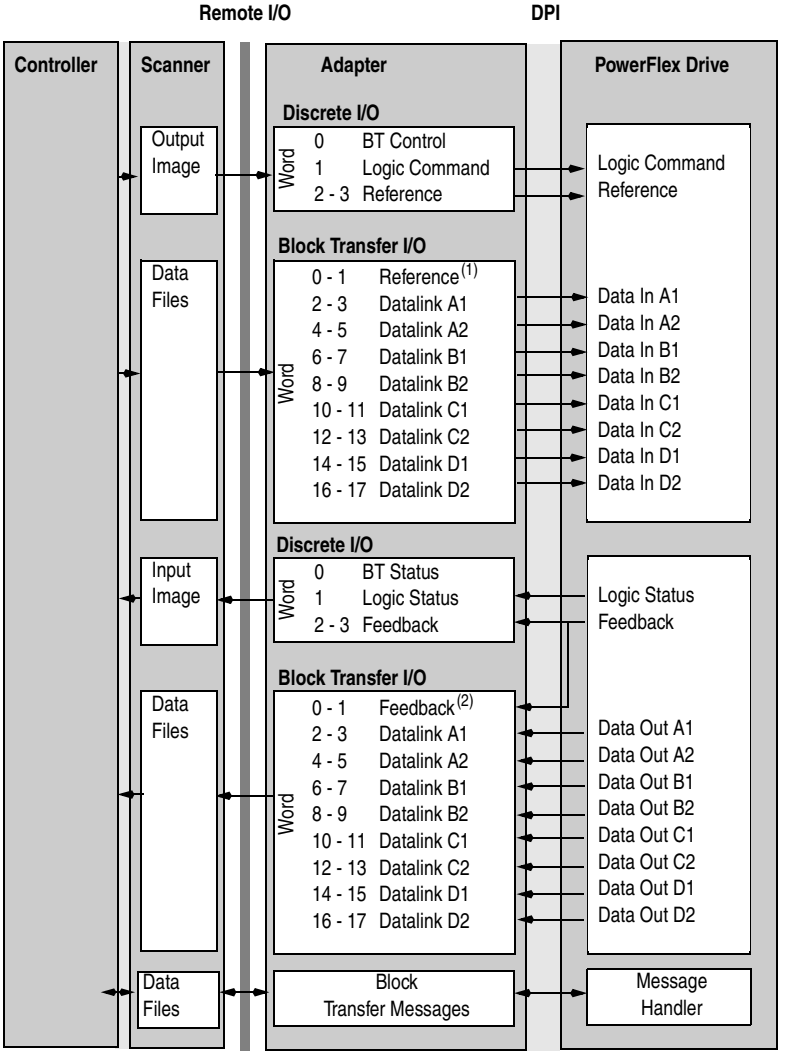


Figure 4.2 Example I/O Image (1/2 Rack Configuration)



(1) Not used in 1/2 rack. The space is reserved so the Datalinks occupy the same Block Transfer I/O locations regardless of 1/4 or 1/2 rack configuration.

(2) Feedback is transmitted in both Discrete I/O and Block Transfer I/O.

Discrete I/O Image

The discrete I/O image will be either a 1/4 rack or 1/2 rack. You select whether to use 1/4 rack or 1/2 rack using DIP switch 4 or, if switches have been disabled, **Parameter 27 - [Rack Size]**. The I/O that is transmitted depends on the size of the rack. Figure 4.1 shows a 1/4 rack, and Figure 4.2 shows a 1/2 rack.

Data in the discrete I/O image is transferred between the controller and Remote I/O adapter every scan.

Block Transfer Control / Block Transfer Status

Word 0 in the discrete I/O image is always the 16-bit Block Transfer Control/Status word. The *Block Transfer Control* word is used for handshaking between the scanner and adapter. Do not change this word. The *Block Transfer Status* word is used to determine when you can write and read Block Transfers for Explicit Messages. The Executing Block Transfers for Explicit Messages section in Chapter 5 explains the bits in this word and how to use them. Block Transfer I/O does not use the Block Transfer Status word.

Logic Command/Logic Status in Discrete I/O Image

Word 1 in the discrete I/O image is always the Logic Command/Logic Status word. The *Logic Command* word is a 16-bit word that is used to control the drive (for example, start, stop, change direction). The *Logic Status* word provides details about how the drive is operating. The definition of the bits in these words depends on the connected drive. Appendix D, Logic Command/Status Words, contains the definitions of the Logic Command/Status words for PowerFlex 70 and 700 drives.

Reference/Feedback in Discrete I/O Image

If the adapter is configured for 1/2 rack (Figure 4.2), word 2 and word 3 in the discrete I/O image are reserved for Reference/Feedback.

Word	16 -bit value		32-bit value	
2	Reference	Feedback	Reference (LSW)	Feedback (LSW)
3	Not Used	0	Reference (MSW)	Feedback (MSW)

LSW = Least Significant Word (bits 0 – 15)
MSW = Most Significant Word (bits 16 – 31)

Block Transfer I/O Image

The Block Transfer I/O image is a Block Transfer message that contains eighteen 16-bit words. It reserves two words for the Reference/Feedback and four words for each Datalink (in case 32-bit values are used).

Figure 4.3 Block Transfer I/O Image for 16-Bit Reference and Datalinks

Word	Block Transfer Write	Block Transfer Read
0	Reference	Feedback
1	Not Used	0
2	Datalink In A1	Datalink Out A1
3	Not Used	0
4	Datalink In A2	Datalink Out A2
5	Not Used	0
6	Datalink In B1	Datalink Out B1
7	Not Used	0
8	Datalink In B2	Datalink Out B2
9	Not Used	0
10	Datalink In C1	Datalink Out C1
11	Not Used	0
12	Datalink In C2	Datalink Out C2
13	Not Used	0
14	Datalink In D1	Datalink Out D1
15	Not Used	0
16	Datalink In D2	Datalink Out D2
17	Not Used	0

Figure 4.4 Block Transfer I/O Image for 32-Bit Reference and Datalinks

Word	Block Transfer Write	Block Transfer Read
0	Reference (LSW)	Feedback (LSW)
1	Reference (MSW)	Feedback (MSW)
2	Datalink In A1 (LSW)	Datalink Out A1 (LSW)
3	Datalink In A1 (MSW)	Datalink Out A1 (MSW)
4	Datalink In A2 (LSW)	Datalink Out A2 (LSW)
5	Datalink In A2 (MSW)	Datalink Out A2 (MSW)
6	Datalink In B1 (LSW)	Datalink Out B1 (LSW)
7	Datalink In B1 (MSW)	Datalink Out B1 (MSW)
8	Datalink In B2 (LSW)	Datalink Out B2 (LSW)
9	Datalink In B2 (MSW)	Datalink Out B2 (MSW)
10	Datalink In C1 (LSW)	Datalink Out C1 (LSW)
11	Datalink In C1 (MSW)	Datalink Out C1 (MSW)
12	Datalink In C2 (LSW)	Datalink Out C2 (LSW)
13	Datalink In C2 (MSW)	Datalink Out C2 (MSW)
14	Datalink In D1 (LSW)	Datalink Out D1 (LSW)
15	Datalink In D1 (MSW)	Datalink Out D1 (MSW)
16	Datalink In D2 (LSW)	Datalink Out D2 (LSW)
17	Datalink In D2 (MSW)	Datalink Out D2 (MSW)

LSW = Least Significant Word (bits 0 – 15)
MSW = Most Significant Word (bits 16 – 31)

Block Transfer I/O requests must be eighteen (18) words or fewer. If a Reference or Datalink In field is not configured to be used by the adapter, any value placed in the field will be ignored by the adapter. If a Datalink Out field is not configured to be used by the adapter, the value of that field is undefined. The Feedback field will always contain the Feedback from the drive. If a request has fewer than eighteen words, as much I/O data as will fit in the request will be used.

Reference/Feedback in Block Transfer I/O Image

Word 0 and word 1 are reserved for the Reference/Feedback. The size of the Reference (16-bits or 32-bits) is determined by the drive. If a 16-bit Reference (Figure 4.3) is used, word 1 is not used during writes and read as zero (0) during reads.

Important: If the adapter is configured as a 1/2 rack, it uses the Reference from the discrete I/O and ignores the Reference in the Block Transfer I/O. Feedback is transmitted in both discrete I/O and Block Transfer I/O.

Datalinks in Block Transfer I/O Image

Words 2 through 17 are optionally enabled for Datalinks. A Datalink is a type of mechanism used by some drives to transfer data to and from the scanner. Datalinks can be used to read or write a parameter value. When enabled, each Datalink consumes four 16-bit words in both the input and output Block Transfer I/O image. The size of Datalinks (16 bits or 32 bits) is determined by the drive. If 16-bit Datalinks (Figure 4.3) are used, the most significant word of each Datalink is not used during writes and read as zero (0) during reads.

Rules for Using Datalinks

- Each set of Datalink parameters in a PowerFlex drive can be used by only one adapter. If more than one adapter is connected to a single drive, the adapters must not attempt to use the same Datalink.
- Parameter settings in the drive determine the data passed through the Datalink mechanism. Note that some parameters may not be allowed as Datalinks. Refer to the documentation for your drive for more information.
- When a Datalink is used to change a value, the value is not written to the Non-Volatile Storage. The value is stored in volatile memory and lost when the drive loses power.

32-Bit Parameters using 16-Bit Datalinks

To read (and/or write) a 32-bit parameter using 16-bit Datalinks, typically both Datalinks (A,B,C,D) are set to the 32-bit parameter. For example, to read **Parameter 09 - [Elapsed MWh]**, both Datalink A1 and A2 are set to "9." Datalink A1 will contain the least significant word (LSW) and Datalink A2 the most significant word (MSW). In this example, the parameter 9 value of 5.8MWh is read as a "58" in Datalink A1.

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	LSW	9	58
A2	MSW	9	0

Regardless of the Datalink combination, x1 will always contain the LSW and x2 will always contain the MSW. In the following examples **Parameter 242 - [Power Up Marker]** contains a value of 88.4541 hours.

Example 1

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	LSW	242	32573
A2	- Not Used -	0	0

Example 2

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	- Not Used -	0	0
A2	MSW	242	13

Example 3

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A1	LSW	242	32573
A2	MSW	242	13

Example 4

Datalink	Most/Least Significant Word	Parameter	Data (decimal)
A2	MSW	242	13
B1	LSW	242	32573

32-bit data is stored in binary as follows:

MSW	2^{31} through 2^{16}
LSW	2^{15} through 2^{0}

Example:
Parameter 242 - [Power Up Marker] = 88.4541 hours
MSW = $13_{decimal}$ = 13 x 65,536 (2^{16})= 851968
LSW = 32573
851968 + 32573 = 884541

Example Programs

These example ladder logic programs work with PowerFlex 70 or PowerFlex 700 drives with the 20-COMM-R in 1/4 rack mode and perform the following:

- Use the Logic Command to control the drive (i.e. start, stop) and receive Logic Status information back from the drive (i.e. ready, fault).
- Send a Reference to the drive and receive Feedback by Block Transfer I/O.
- Read/Write Datalinks to/from the drive by Block Transfer I/O.
- Access the drive via Block Transfer Messaging, see Chapter 5, Using Block Transfer Messaging.

Adapter Settings for the Example Programs

Switches have been disabled and the following parameters have been set:

- **Parameter 03 - [RIO Addr Cfg]** = 1
- **Parameter 12 - [DPI I/O Config]** = xxx0 0011
  Logic Command/Reference and Datalink A are enabled.
- **Parameter 25 - [Start RIO Group]** = Group 0
- **Parameter 27 - [Rack Size]** = 1/4 rack

Scanner Settings for the Example Programs

- Data files, when used, are pointed out in the examples.

Logic Command/Status Words

- These examples use the Logic Command word and Logic Status word for PowerFlex 70 and PowerFlex 700 drives. Refer to Appendix D, Logic Command/Status Words to view these. The definition of the bits in these words may vary if you are using a different DPI Host product. Refer to the documentation for your DPI Host product.

ControlLogix Example

Figure 4.5 ControlLogix Main Routine

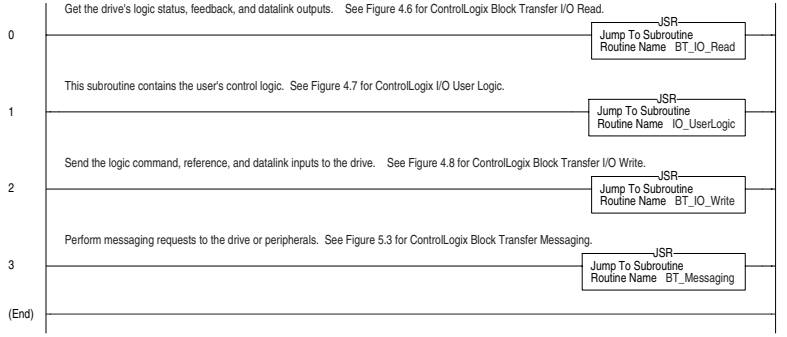
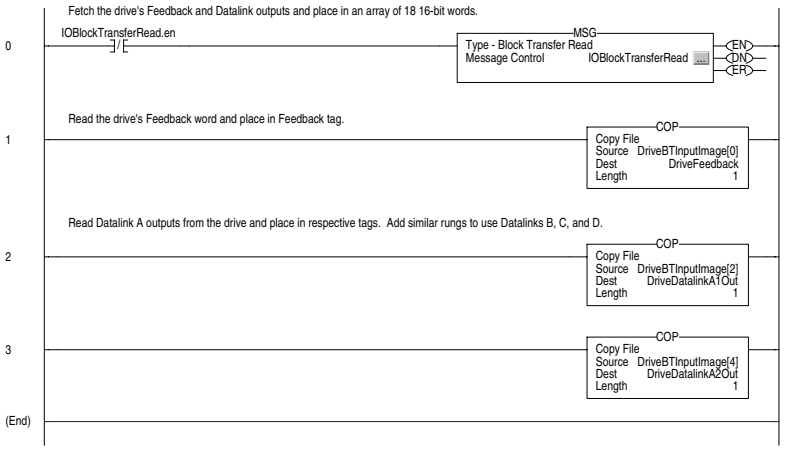

Get the drive's logic status, feedback, and datalink outputs. See Figure 4.6 for ControlLogix Block Transfer I/O Read.
0
JSR
Jump To Subroutine
Routine Name BT_IO_Read
This subroutine contains the user's control logic. See Figure 4.7 for ControlLogix I/O User Logic.
1
JSR
Jump To Subroutine
Routine Name IO_UserLogic
Send the logic command, reference, and datalink inputs to the drive. See Figure 4.8 for ControlLogix Block Transfer I/O Write.
2
JSR
Jump To Subroutine
Routine Name BT_IO_Write
Perform messaging requests to the drive or peripherals. See Figure 5.3 for ControlLogix Block Transfer Messaging.
3
JSR
Jump To Subroutine
Routine Name BT_Messaging
(End)

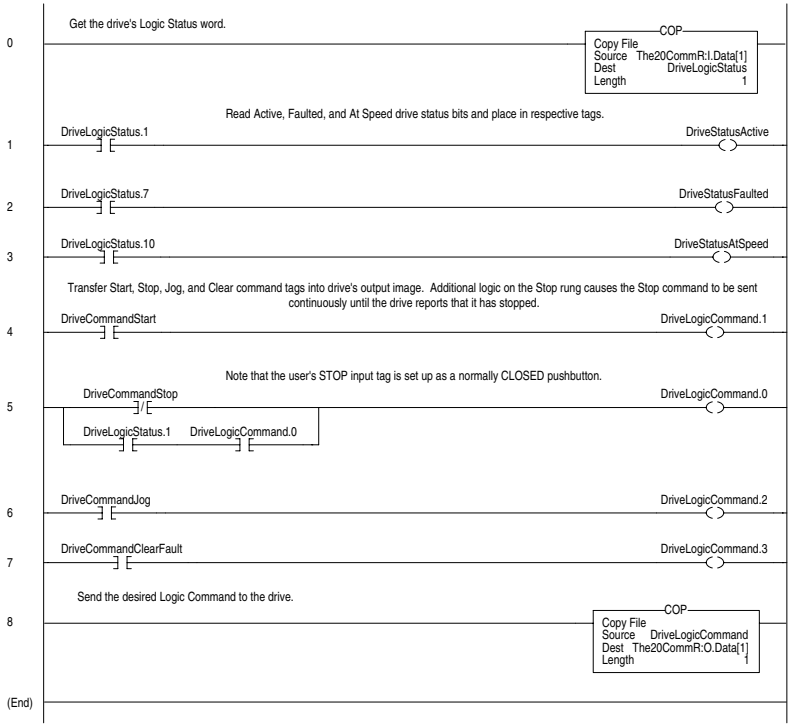
Figure 4.6 ControlLogix Block Transfer I/O Read



Tag Name	Type
I/O BlockTransferRead	MESSAGE
The 20CommR:I	AB:RIO_4IOGROUP:I:0
DriveLogicStatus	INT
DriveBTInputImage	INT[18]
DriveFeedback	INT
DriveDatalinkA1Out	INT
DriveDatalinkA2Out	INT

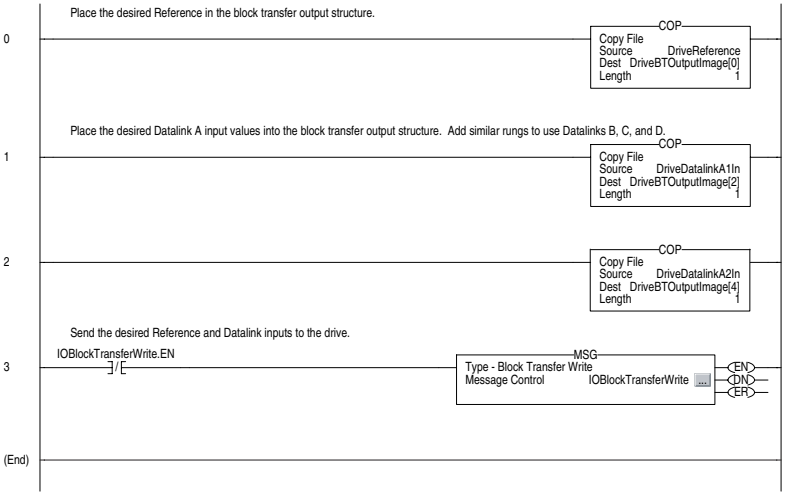
Refer to Figure 4.3 for Block Transfer I/O Image Layout.

Figure 4.7 ControlLogix I/O User Logic



Tag Name	Type
DriveLogicStatus	INT
DriveCommandStart	BOOL
DriveCommandStop	BOOL
DriveCommandJog	BOOL
DriveStatusActive	BOOL
DriveStatusFaulted	BOOL
DriveStatusAtSpeed	BOOL
DriveLogicCommand	INT

Figure 4.8 ControlLogix Block Transfer I/O Write



Tag Name	Type
DriveReference	INT
DriveBTOutputImage	INT [18]
DriveDatalinkA1In	INT
DriveDatalinkA2In	INT
DriveLogicCommand	INT
The20CommR:O	AB:RIO_4IOGROUP:O:0
IOBlockTransferWrite	MESSAGE

Refer to Figure 4.3 for Block Transfer I/O Image Layout.

PLC Example

Figure 4.9 PLC Main Routine

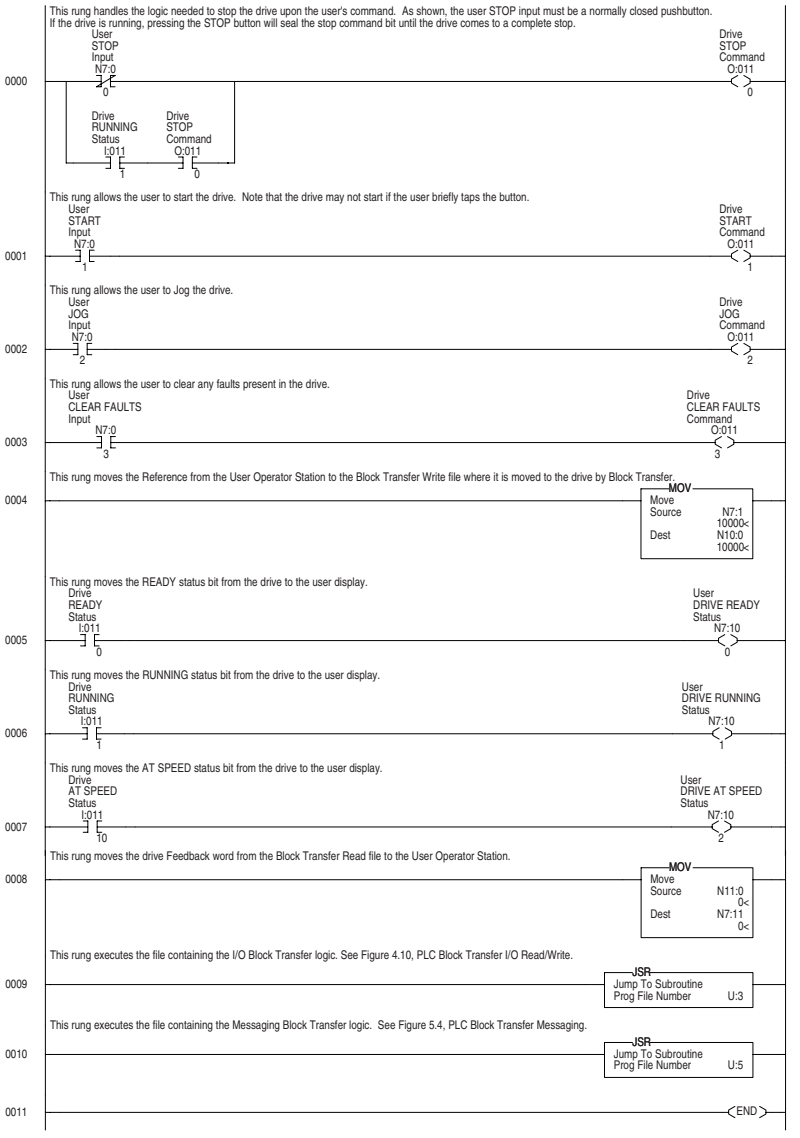
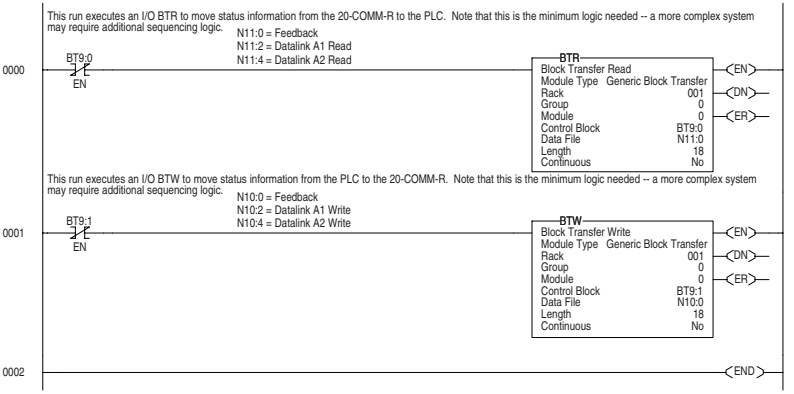

This rung handles the logic needed to stop the drive upon the user's command. As shown, the user STOP input must be a normally closed pushbutton.
If the drive is running, pressing the STOP button will seal the stop command bit until the drive comes to a complete stop.
User STOP Input N7:0 0
Drive STOP Command O:011 0
Drive RUNNING Status I:011 1
Drive STOP Command O:011 0
0000
This rung allows the user to start the drive. Note that the drive may not start if the user briefly taps the button.
User START Input N7:0 1
Drive START Command O:011 1
0001
This rung allows the user to Jog the drive.
User JOG Input N7:0 2
Drive JOG Command O:011 2
0002
This rung allows the user to clear any faults present in the drive.
User CLEAR FAULTS Input N7:0 3
Drive CLEAR FAULTS Command O:011 3
0003
This rung moves the Reference from the User Operator Station to the Block Transfer Write file where it is moved to the drive by Block Transfer.
0004
MOV
Move
Source N7:1 10000<
Dest N10:0 10000<
This rung moves the READY status bit from the drive to the user display.
Drive READY Status I:011 0
User DRIVE READY Status N7:10 0
0005
This rung moves the RUNNING status bit from the drive to the user display.
Drive RUNNING Status I:011 1
User DRIVE RUNNING Status N7:10 1
0006
This rung moves the AT SPEED status bit from the drive to the user display.
Drive AT SPEED Status I:011 T0
User DRIVE AT SPEED Status N7:10 2
0007
This rung moves the drive Feedback word from the Block Transfer Read file to the User Operator Station.
0008
MOV
Move
Source N11:0 0<
Dest N7:11 0<
This rung executes the file containing the I/O Block Transfer logic. See Figure 4.10, PLC Block Transfer I/O Read/Write.
0009
JSR
Jump To Subroutine
Prog File Number U:3
This rung executes the file containing the Messaging Block Transfer logic. See Figure 5.4, PLC Block Transfer Messaging.
0010
JSR
Jump To Subroutine
Prog File Number U:5
0011
END

Figure 4.10 PLC Block Transfer I/O (Read/Write)



Refer to Figure 4.3 for Block Transfer I/O Image Layout.

SLC Example

The SLC RIO scanner performs Block Transfers through control/status buffers that you allocate in the scanner's M0 and M1 files. The first 10 words of each file are reserved for either control words (M0) or status words (M1). Block Transfer Read/Write data starts in word 11. Refer to the 1747-SN User Manual, publication 1747-6.6 for more information.

The following data is required for the example program.

Address	Value (decimal)	Description
N10:1	18	Block Transfer Write Length
N10:2	100	Rack 1, Group 0, Slot 0
N11:1	18	Block Transfer Read Length
N11:2	100	Rack 1, Group 0, Slot 0

The length of "28" words used in the COP instructions in the ladder example, reflect the 10 reserved words plus 18 words of data.

Figure 4.11 SLC Main Routine (I/O User Logic)

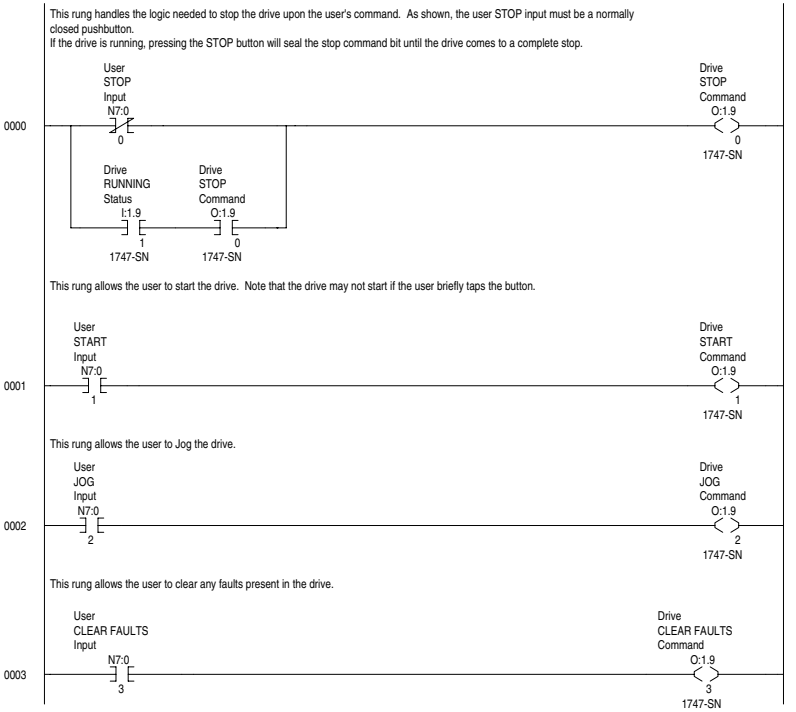

This rung handles the logic needed to stop the drive upon the user's command. As shown, the user STOP input must be a normally closed pushbutton.
If the drive is running, pressing the STOP button will seal the stop command bit until the drive comes to a complete stop.
User STOP Input N7:0 0
Drive STOP Command O:1.9 0 1747-SN
0000
Drive RUNNING Status I:1.9 1 1747-SN
Drive STOP Command O:1.9 0 1747-SN
This rung allows the user to start the drive. Note that the drive may not start if the user briefly taps the button.
User START Input N7:0 1
Drive START Command O:1.9 1 1747-SN
0001
This rung allows the user to Jog the drive.
User JOG Input N7:0 2
Drive JOG Command O:1.9 2 1747-SN
0002
This rung allows the user to clear any faults present in the drive.
User CLEAR FAULTS Input N7:0 3
Drive CLEAR FAULTS Command O:1.9 3 1747-SN
0003

Figure 4.11 SLC Main Routine (I/O User Logic) – *continued*

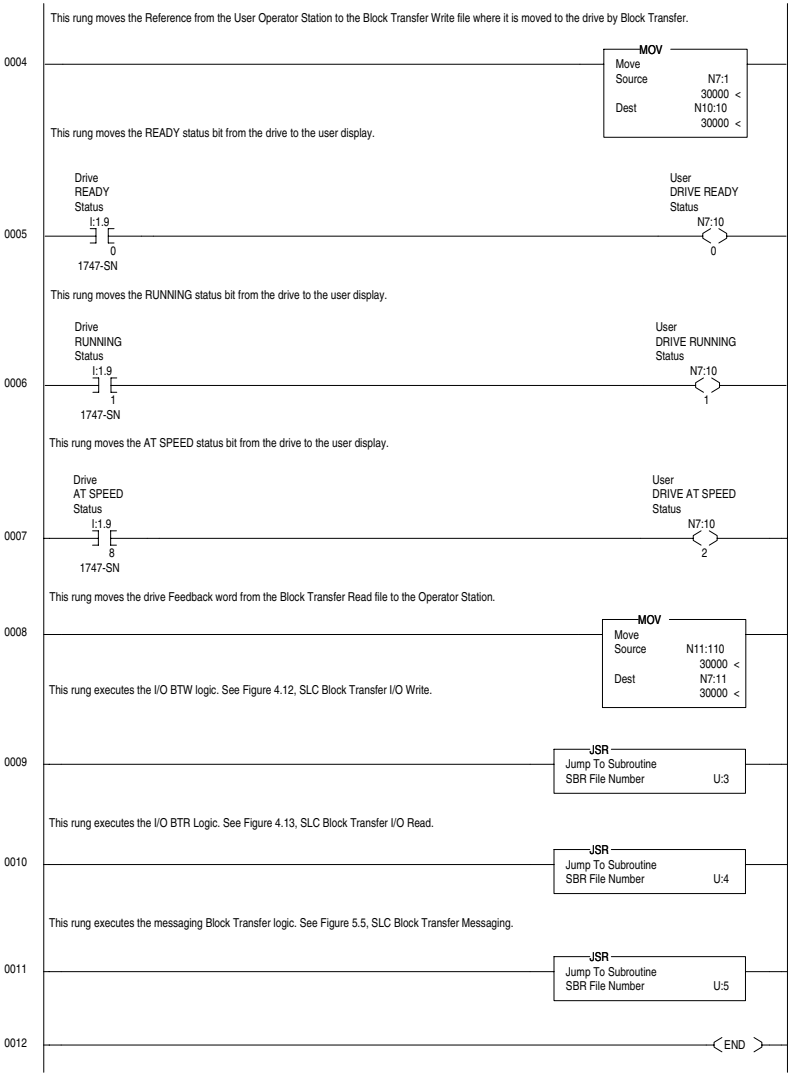
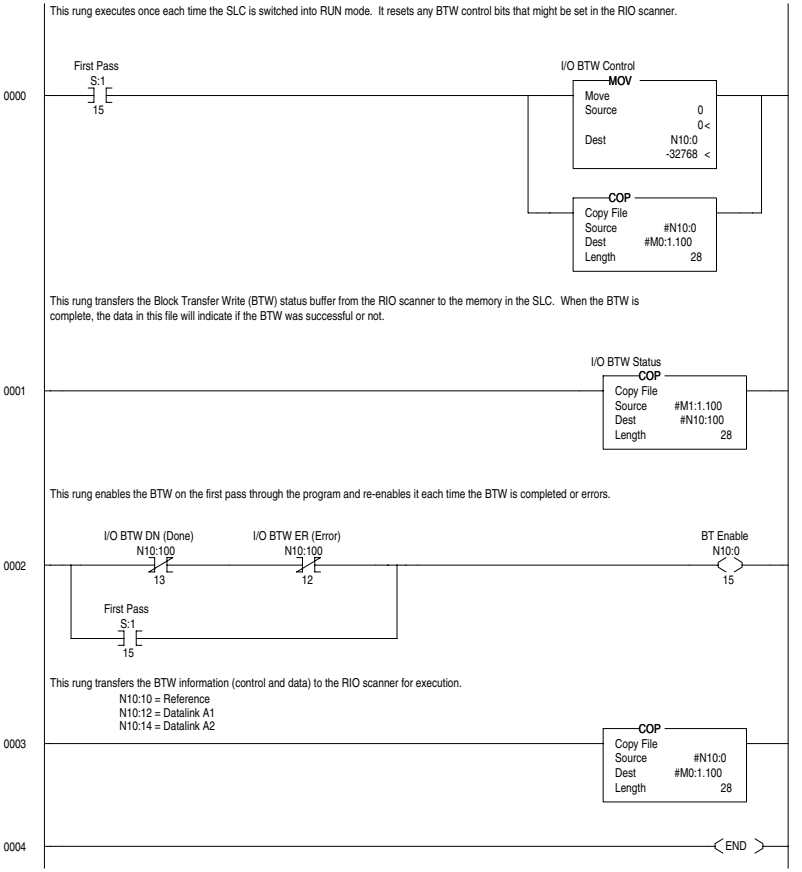
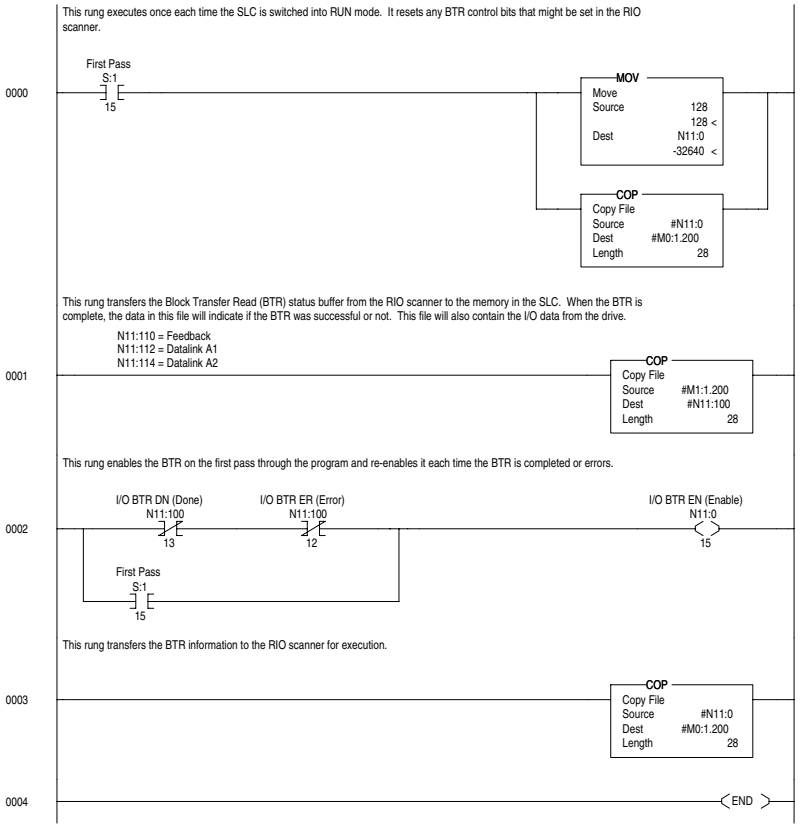


Figure 4.12 SLC Block Transfer I/O Write



Refer to Figure 4.3 for Block Transfer I/O Image Layout.

Figure 4.13 SLC Block Transfer I/O Read



Refer to Figure 4.3 for Block Transfer I/O Image Layout.

Notes:

Using Block Transfer Messaging

Chapter 5 provides information and examples for using Block Transfer to send Explicit Messages to configure and monitor a PowerFlex drive on a Remote I/O network.

Topic	Page
About Block Transfer Messaging	5-1
Formatting Block Transfer Messages	5-2
Executing Block Transfers for Explicit Messages	5-5
Example Programs	5-6
ControlLogix Example	5-7
PLC Example	5-10
SLC Example	5-12

ATTENTION: Risk of equipment damage exists. If Block Transfer is used to send Explicit Messages that are programmed to write parameter data to Non-Volatile Storage (NVS) frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not create a program that frequently uses Block Transfer to send Explicit Messages to write parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters.

ATTENTION: Risk of injury or equipment damage exists. The examples in this publication are intended solely for purposes of example. There are many variables and requirements with any application. Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use of the examples shown in this publication.

About Block Transfer Messaging

Block Transfer messaging is used to transfer data to the drive. The size of Block Transfer messages to the Remote I/O adapter determines their purpose.

Words	Type	Used for	Refer to
18 or fewer	I/O	Reference/Feedback and Datalinks	Chapter 4
20, 30, or 60	Explicit	Configuring and monitoring data	Chapter 5
Other	Not Recognized	Do not use or an error will result.	

Block Transfer I/O

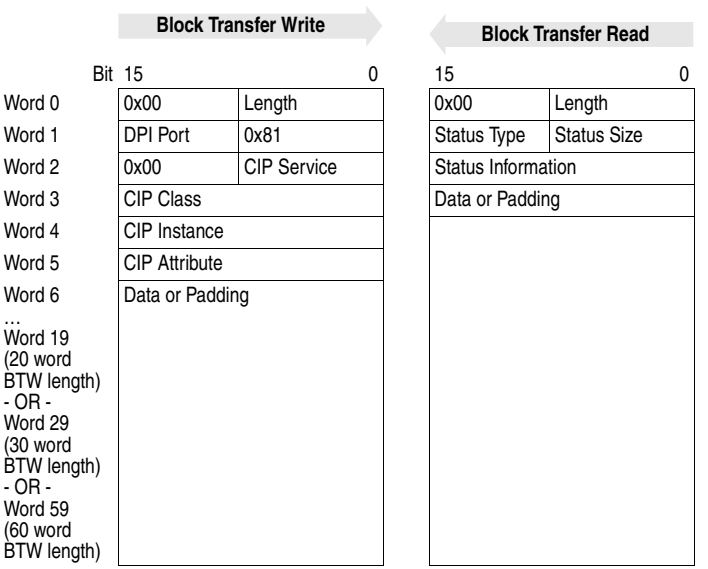
For information about Block Transfer I/O messages, refer to Chapter 4, Using Discrete & Block Transfer I/O.

One Block Transfer request is processed per Remote I/O rack scan, but multiple requests to a rack can be initiated. You can use Block Transfer Read messages to gather input and status data from the adapter and Block Transfer Write messages to send output and configuration data to the adapter and connected drive.

Formatting Block Transfer Messages

Using Block Transfer to Initiate Explicit Messages

Figure 5.1 Explicit Message Format



Most Significant Byte = bits 15 – 8
Least Significant Byte = bits 7 – 0

Refer to page 5-3 for a description of each word in a Block Transfer Write used for initiating Explicit Messages.

Refer to page 5-4 for a description of each word in a Block Transfer Read used for receiving an Explicit Message response.

Block Transfer Write Structure For Sending Block Transfer Messages

Data Field	Description
Word 0	**Length** The least significant byte contains the length of the Explicit Message. The most significant byte is always zero. This is the length of the actual message in bytes, not the size of the BTW in words. This length excludes the two bytes of word 0, but includes words 1 and 2, and all of the data in the main body of the message to be sent. If using a scattered read or write with class code 0x93, the length includes the zero(es) after the last parameter as place holders. See pages C-11–C-15.
Word 1	**0x81 and DPI Port** The least significant byte contains the value 0x81. The most significant byte is the DPI port. For PowerFlex drives, you can access: 0 - Drive 1 - Device at Port 1 (HIM) 2 - Device at Port 2 3 - Device at Port 3 4 - Device at Port 4 5 - Device at Port 5 (adapter) 6 - Device at Port 6
Word 2	**CIP Service** The least significant byte contains a CIP service. The most significant byte is always zero (0). CIP services include the following: 0x0E - Get Attribute Single 0x10 - Set Attribute Single 0x4B - Get Attributes Scattered 0x4C - Set Attributes Scattered
Word 3	**CIP Class** Refer to Appendix C, CIP Objects, for a list of classes.
Word 4	**CIP Instance** Refer to Appendix C, CIP Objects, for an instances in each class.
Word 5	**CIP Attribute** Refer to Appendix C, CIP Objects, for a list of attributes in each class.
Word 6 – 19 Word 6 – 29 Word 6 – 59	**Data or Padding** Data required for the message. The message must be either 20 words, 30 words, or 60 words. If it is not, pad the message with zeros.

Block Transfer Read Structure For Receiving Block Transfer Messages

Data Field	Description
Word 0	**Length** The least significant byte contains the length of the actual Explicit Message in bytes. The most significant byte is always zero.
Word 1	**Status Size and Status Type** If an error occurred during the Explicit Message, the least significant byte will contain the size of the status information and the most significant byte will contain the type of status (1 = DPI, 2 = CIP) information. If the Explicit Message completed without an error occurring, both of these bytes will have values of zero. 0x00 Message successful 0x01 DPI error 0x02 CIP error
Word 2	**Status Information** The least significant byte will contain the status information: *CIP* *DPI* 0x00 0x00 Message is successful. 0x0E 0x01 Service is not supported. 0x08 0x02 Service is not valid. 0x16 0x03 Class is not supported. 0x16 0x04 Instance is not supported. 0x14 0x05 Attribute is not supported. 0x09 0x06 Data value is out of range for the attribute. 0x10 0x07 The object is not in a correct state for the service. For example, certain attributes cannot be set while the drive is running. 0x13 0x08 Not enough data was provided for the message. 0x15 0x09 Too much data was provided for the message. 0x0A Router message error. 0x0B Resource unavailable. 0x0C Transport Error.
Word 3 – 19 Word 2 – 29 Word 2 – 59	**Data or Padding** This is the Explicit Message response data.

Executing Block Transfers for Explicit Messages

1. **Enter data into the program.**

   Data must be entered into a data file for a program to run. The data file that is used depends on your controller and application.

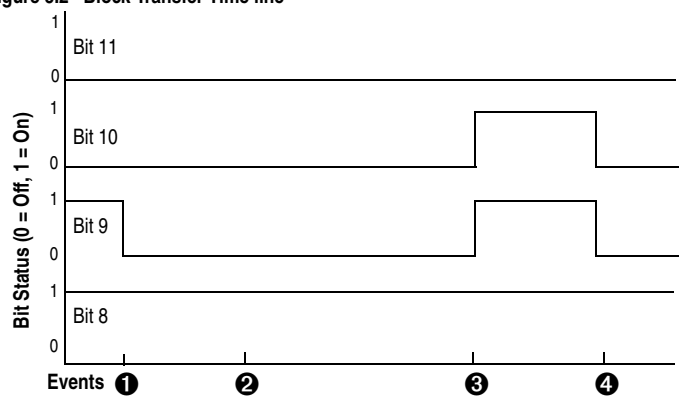
2. **Run the program.**

   When executing a Block Transfer message, the program must monitor the Block Transfer Status word (word 0) in the Discrete I/O Image. Its bits are defined as follows:

Bits	Name and Description
0 – 7	**Node Adapter Chip** These bits are used by the node adapter chip to communicate with the master on the network. The master application should not use these bits.
8	**DATA_VALID** 0 = Data from the drive is not valid. 1 = Data from the drive is valid.
9	**Message Block Transfer Write Available** 0 = Not ready 1 = Ready to receive a Block Transfer write.
10	**Message Block Transfer Read Available** 0 = Not ready 1 = Data is available for a Block Transfer read.
11	**Message Block Transfer Error** 0 = Block Transfer message succeeded. 1 = Block Transfer message failed.
12 – 15	**Reserved** Do not use.

Figure 5.2 illustrates the events of a successful Block Transfer.

Figure 5.2 Block Transfer Time line



The following table describes the main events and what a program should be monitoring when performing Block Transfer messaging.

#	Event	Description
❶	BTW Request	Before initiating a Block Transfer message, bit 8 must be 1. This setting indicates that the adapter and drive are communicating, so a Block Transfer message will reach the drive. Before initiating a Block Transfer Write message, bit 9 must be 1. This setting indicates that a Block Transfer Write can be executed.
❷	BTW Data At the Adapter	Because only one Block Transfer message can be active at a time, Bit 9 is set to 0 when the Block Transfer Write begins. It and Bit 10 remain at zero while the Block Transfer is being processed.
❸	BTW Complete	When the Block Transfer is complete, bit 9 and bit 10 are set to 1. This setting indicates that the program can perform either a Block Transfer Read or a Block Transfer Write. Bit 11 remains at 0 if messaging is successful. If an error occurs, it would be set to 1.
❹	BTR Request	Before initiating a Block Transfer Read message, bit 10 must be set to 1. This setting indicates that data is available to read. When the message is executed, bits 9 & 10 are set to 0 because only one Block Transfer can be active at a time.

3. Receive data from the program.

After the program with Block Transfer messages has been run, the results can be seen in a data file. The data file that is used depends on your controller and application.

Example Programs

The example ladder logic programs (Figure 5.3 – Figure 5.5) can be used to demonstrate how Block Transfer can be used to send Explicit Messages from a ControlLogix, PLC, or SLC controller, respectively. Block Transfer messaging is used to read or write a parameter value from the PowerFlex 70 drive at Rack 1, Group 0, Slot 0.

These example ladder programs are continuations of the Discrete & Block Transfer I/O example ladder programs in Chapter 4. The “Main Routine” ladder logic performs Jump to Subroutines (JSR’s) to these examples.

ControlLogix Example

Data Format for a Read and Write Parameter

The data in this example is for a PowerFlex 70 drive at Remote I/O rack.

This set of arrays shows a read of drive parameter 1, [Output Freq]. The value of parameter 1 is 213 (21.3 Hz).

MsgBlockTransferWrite (Request Data) for Read of Drive Parameter 1 (hex)

Int Address	Value (hex)	Description	Refer to . . .
Offset 0	000A	Length of Message = 10 bytes (A hex)	5-3
Offset 1	0081	Required Setting	5-3
Offset 2	000E	Service = Get_Attribute_Single	C-1
Offset 3	0093	Class = 93 DPI Parameter Object	C-7
Offset 4	0001	Instance = Parameter 1 (1 hex)	C-7
Offset 5	0009	Attribute = 09 DPI Parameter Value	C-8

MsgBlockTransferRead (Response Data) for Read of Drive Parameter 1 (hex)

Int Address	Value (hex)	Description	Refer to . . .
Offset 0	0004	Length of Message = 4 bytes	5-4
Offset 1	0000	The Message was Successful	5-4
Offset 2	0000		
Offset 3	00D5	Response Data = 213 (D5 hex) = 21.3 Hz.	

This set of data files shows a write of drive parameter 41 [Motor NP Volts]. The value written is 2300 (230.0V AC).

MsgBlockTransferWrite (Request Data) for Write of Drive Parameter 41 (hex)

Int Address	Value (hex)	Description	Refer to . . .
Offset 0	000C	Length of Message = 12 bytes (C hex)	5-3
Offset 1	0081	Required Setting	5-3
Offset 2	0010	Service = Set_Attribute_Single	C-1
Offset 3	0093	Class = 93 DPI Parameter Object	C-7
Offset 4	0029	Instance = Parameter 41 (29 hex)	C-7
Offset 5	0009	Attribute = 09 DPI Parameter Value	C-8
Offset 6	08FC	Data = 2300 (8FC hex) = 230.0V AC	

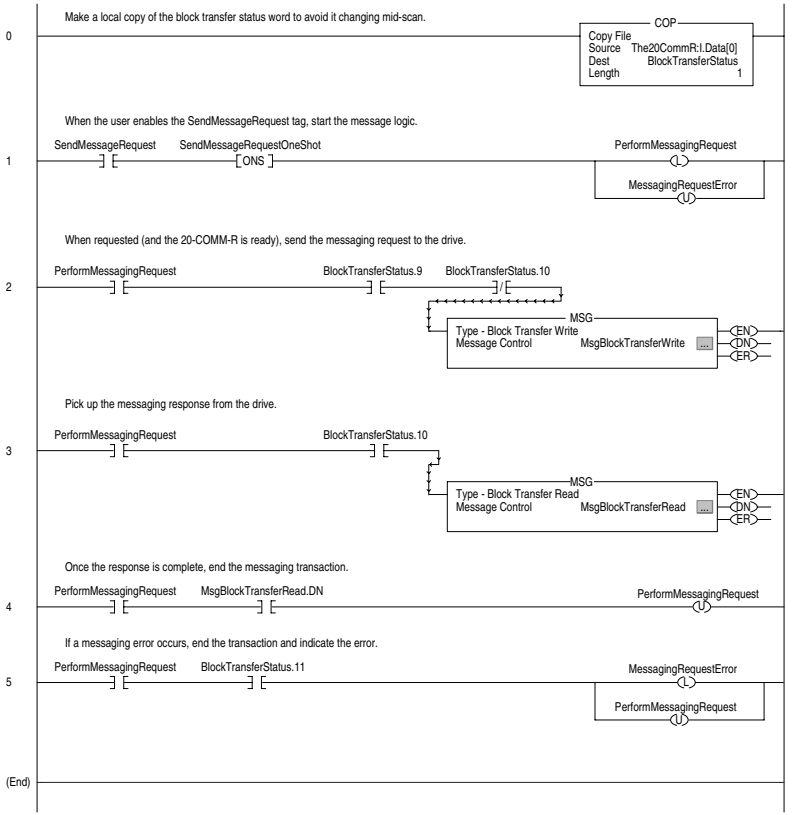
MsgBlockTransferRead (Response Data) for Write of Drive Parameter 41 (hex)

Int Address	Value (hex)	Description	Refer to . . .
Offset 0	0002	Length of Message = 2 bytes	5-4
Offset 1	0000	The Message was Successful	5-4
Offset 2	0000		

Refer to Formatting Block Transfer Messages on page 5-2 for more information on block transfer messages.

Program

Figure 5.3 ControlLogix Block Transfer Messaging



Tag Name	Type
SendMessageRequest	BOOL
SendMessageRequestOneShot	BOOL
PerformingMessagingRequest	BOOL
MessagingRequestError	BOOL
The20CommR:I	AB:RIO_4IOGROUP:I:0
MsgBlockTransferWrite	MESSAGE
MsgBlockTransferRead	MESSAGE

PLC Example

Block Transfer Data files for PLC-5 Example Program

This set of data files shows a read of drive parameter 1, [Output Freq]. The value of parameter 1 is 213 (21.3 Hz).

Request Data (BTW) for Read of Drive Parameter 1 (hex)

Address	Value (hex)	Description	Refer to . . .
N12:0	000A	Length of Message = 10 bytes (A hex)	5-3
N12:1	0081	Required Setting	5-3
N12:2	000E	Service = Get_Attribute_Single	C-1
N12:3	0093	Class = 93 DPI Parameter Object	C-7
N12:4	0001	Instance = Parameter 1 (1 hex)	C-7
N12:5	0009	Attribute = 09 DPI Parameter Value	C-8

Response Data (BTR) for Read of Drive Parameter 1 (hex)

Address	Value (hex)	Description	Refer to . . .
N13:0	0004	Length of Message = 4 bytes	5-4
N13:1	0000	The Message was Successful	5-4
N13:2	0000		
N13:3	00D5	Response Data = 213 (D5 hex) = 21.3 Hz.	

This set of data files shows a write of drive parameter 41 [Motor NP Volts]. The value written is 2300 (230.0V AC).

Request Data (BTW) for Write of Drive Parameter 41 (hex)

Address	Value (hex)	Description	Refer to . . .
N12:0	000C	Length of Message = 12 bytes (C hex)	5-3
N12:1	0081	Required Setting	5-3
N12:2	0010	Service = Set_Attribute_Single	C-1
N12:3	0093	Class = 93 DPI Parameter Object	C-7
N12:4	0029	Instance = Parameter 41 (29 hex)	C-7
N12:5	0009	Attribute = 09 DPI Parameter Value	C-8
N12:6	08FC	Data = 2300 (8FC hex) = 230.0V AC	

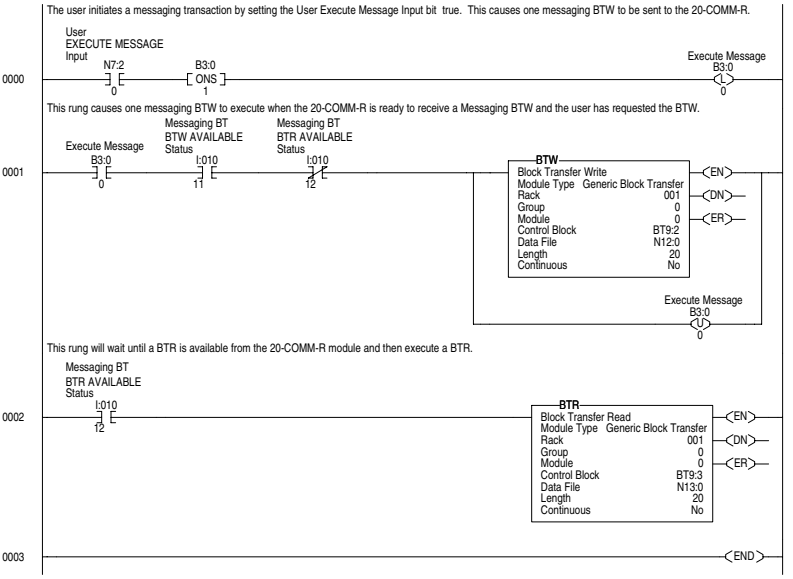
Response Data (BTR) for Write of Drive Parameter 41 (hex)

Address	Value (hex)	Description	Refer to . . .
N13:0	0002	Length of Message = 2 bytes	5-4
N13:1	0000	The Message was Successful	5-4
N13:2	0000		

Refer to Formatting Block Transfer Messages on page 5-2 for more information on block transfer messages.

Ladder Logic Program

Figure 5.4 PLC-5 Block Transfer Messaging



The word length used in the BTW and BTR must be equal to 20, 30 or 60. It must also be greater than or equal to the byte length used in Word 0 of the message, converted to words (1 word = 2 bytes).

SLC Example

Block Transfer Data files for SLC Example Program

This set of data files shows a read of drive parameter 1, [Output Freq]. The value of parameter 1 is 213 (21.3 Hz).

Request and Control Data for Read of Drive Parameter 1 (hex)

Address	Value (hex)	Description	Refer to . . .
N12:10	000A	Length of Message = 10 bytes (A hex)	5-3
N12:11	0081	Required Setting	5-3
N12:12	000E	Service = Get_Attribute_Single	C-1
N12:13	0093	Class = 93 DPI Parameter Object	C-7
N12:14	0001	Instance = Parameter 1 (1 hex)	C-7
N12:15	0009	Attribute = 09 DPI Parameter Value	C-8

Response and Control Data for Read of Drive Parameter 1 (hex)

Address	Value (hex)	Description	Refer to . . .
N13:110	0004	Length of Message = 4 bytes	5-4
N13:111	0000	The Message was Successful	5-4
N13:112	0000		
N13:113	00D5	Response Data = 213 (D5 hex) = 21.3 Hz.	

This set of data files shows a write of drive parameter 41 [Motor NP Volts]. The value written is 2300 (230.0V AC).

Request and Control Data for Write of Drive Parameter 41 (hex)

Address	Value (hex)	Description	Refer to . . .
N12:10	000C	Length of Message = 12 bytes (C hex)	5-3
N12:11	0081	Required Setting	5-3
N12:12	0010	Service = Set_Attribute_Single	C-1
N12:13	0093	Class = 93 DPI Parameter Object	C-7
N12:14	0029	Instance = Parameter 41 (29 hex)	C-7
N12:15	0009	Attribute = 09 DPI Parameter Value	C-8
N12:16	08FC	Data = 2300 (8FC hex) = 230.0V AC	

Response and Control Data for Write of Drive Parameter 41 (hex)

Address	Value (hex)	Description	Refer to . . .
N13:110	0002	Length of Message = 2 bytes	5-4
N13:111	0000	The Message was Successful	5-4
N13:112	0000		

Block Transfers are handled differently in the SLC and require the following data for the example program.

Address	Value (decimal)	Description
N12:1	20	Block Transfer Write Length
N12:2	100	Rack 1, Group 0, Slot 0
N13:1	20	Block Transfer Read Length
N13:2	100	Rack 1, Group 0, Slot 0

Refer to Formatting Block Transfer Messages on page 5-2 for more information on block transfer messages.

Program

Figure 5.5 SLC Block Transfer Messaging

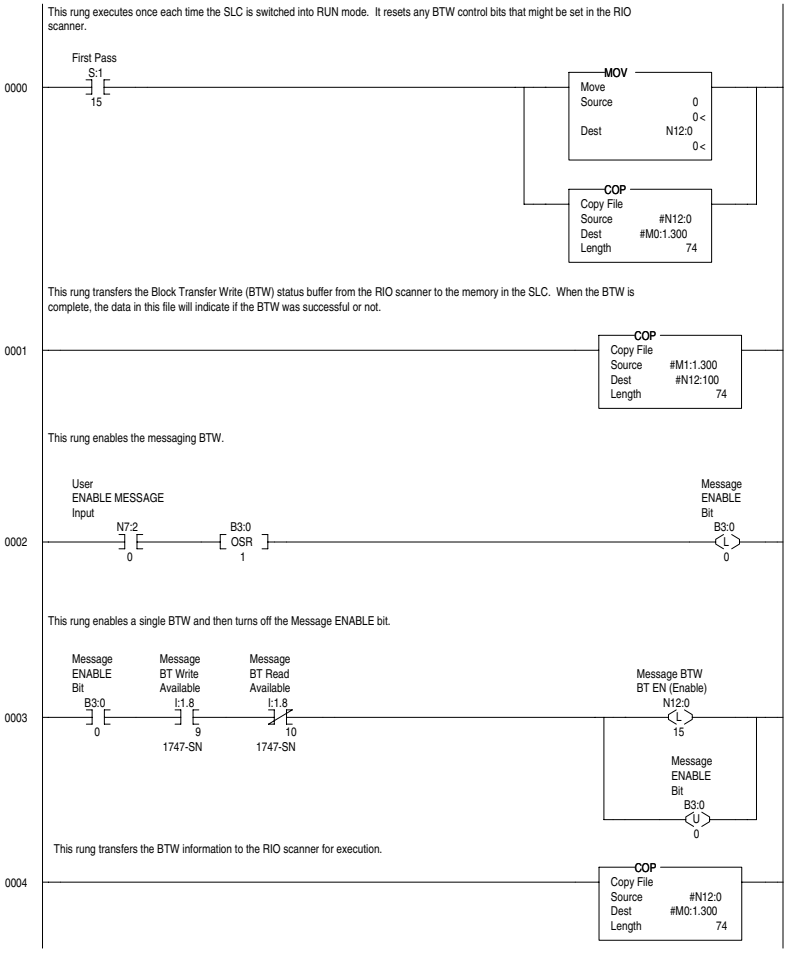
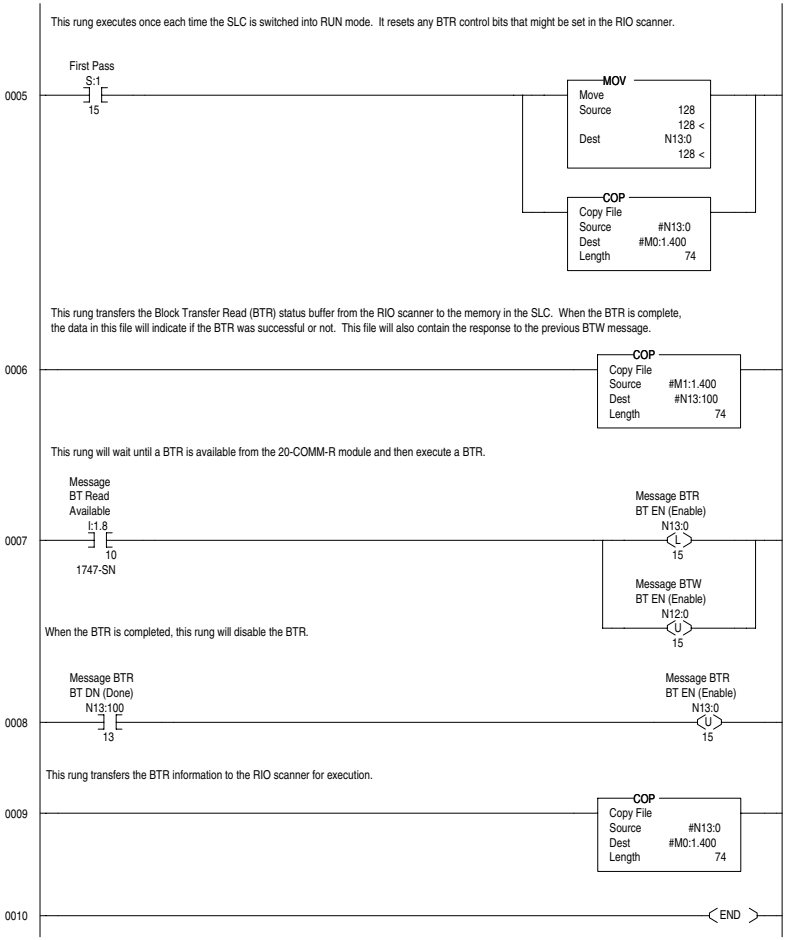


Figure 5.5 SLC Block Transfer Messaging Example *(continued)*



Notes:

Troubleshooting

Chapter 6 contains troubleshooting information.

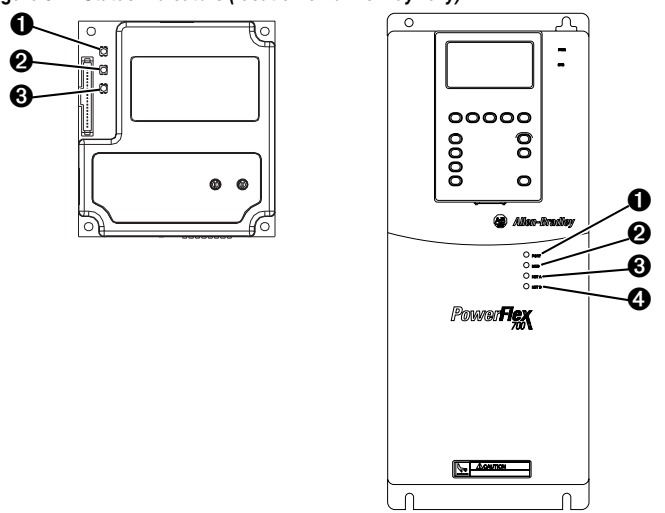
Topic	Page
Locating the Status Indicators	6-1
PORT Status Indicator	6-2
MOD Status Indicator	6-2

Topic	Page
NET A Status Indicator	6-3
Module Diagnostic Items	6-4
Viewing and Clearing Events	6-6

Locating the Status Indicators

The adapter has three status indicators. They can be viewed on the adapter or through the drive cover. See Figure 6.1.

Figure 6.1 Status Indicators *(location on drive may vary)*



Number	Status Indicator	Description	Page
1	PORT	DPI Connection Status	6-2
2	MOD	Adapter Status	6-2
3	NET A	Remote I/O Status	6-3
4	NET B	Not Used for Remote I/O	

PORT Status Indicator

Status	Cause	Corrective Action
Off	The adapter is not powered or is not connected properly to the drive.	• Securely connect the adapter to the drive using the ribbon cable. • Apply power to the drive.
Flashing Red	The adapter is not receiving a ping message from the drive.	• Verify that cables are securely connected. • Cycle power to the drive.
Solid Red	The drive has refused an I/O connection from the adapter. Another DPI peripheral is using the same DPI port as the adapter.	**Important:** Cycle power to the product after making any of the following corrections. • Verify that all DPI cables are securely connected and not damaged. Replace cables if necessary. • Verify that the DPI Host supports Datalinks. • Configure the adapter to use a Datalink that is not already being used by another peripheral.
Orange	The adapter is connected to a product that does not support Allen-Bradley DPI communications.	• Connect the adapter to a product that supports Allen-Bradley DPI communications (for example, PowerFlex drives).
Flashing Green	The adapter is establishing an I/O connection to the drive or [DPI I/O Config] is configured for all I/O disabled.	• No Action. This status indicator will turn solid green or red. • Verify parameter 12, [DPI I/O Config] settings. • Normal behavior if no DPI I/O is enabled.
Solid Green	The adapter is properly connected and is communicating with the drive.	• No Action.

MOD Status Indicator

Status	Cause	Corrective Action
Off	The adapter is not powered.	• Securely connect the adapter to the drive using the ribbon cable. • Apply power to the drive.
Flashing Red	The adapter has failed the firmware test or the node address switch setting is invalid.	• Verify that the rack address switch setting is between 0 and 77. • Clear faults in the adapter. • Cycle power to the drive. • If cycling power does not correct the problem, the parameter settings may have been corrupted. Reset defaults and reconfigure the module. • If resetting defaults does not correct the problem, flash the adapter with the latest firmware release.
Solid Red	The adapter has failed the hardware test.	• Cycle power to the drive. • Replace the adapter.
Flashing Green	The adapter is operational, but is not transferring I/O data.	• Place the scanner in RUN mode. • Program the controller to recognize and transmit I/O to the adapter. • Configure the adapter for the program in the controller. • Configure the adapter for the program in the controller. • Normal behavior if no DPI I/O is enabled.
Solid Green	The adapter is operational and transferring I/O data.	• No Action.

NET A Status Indicator

Status	Cause	Corrective Actions
Off	The adapter is not powered or is not connected properly to the Remote I/O network.	• Securely connect the adapter to the drive using the ribbon cable and to the Remote I/O network using a Remote I/O cable. • Correctly connect the Remote I/O cable to the 3-pin Remote I/O plug. • Configure the adapter to use the baud rate at which the network is operating. • Configure the adapter to use a unique rack address on the Remote I/O network. • Apply power to the drive. • Apply power to the controller.
Flashing Green	The adapter is properly connected but is not transferring I/O over the Remote I/O network.	• Verify that the scanner is in RUN mode. • Verify that the scanner is using the correct rack size for the adapter. • Verify that the adapter is configured for the correct rack size.
Solid Green	The adapter is properly connected and is communicating with the scanner on the network.	• No action required.

Module Diagnostic Items

The following diagnostic items can be accessed using DriveExplorer (version 2.01 or higher) or the LCD HIM (version 2.001 or higher).

No.	Name	Description
1	Common Logic Cmd	Current value of the Common Logic Command being transmitted to the host by this peripheral. If this diagnostic item is any value other than 1, the values of items 7 through 14 (Datalink A1 In - Datalink D2 In), are not actually being transferred to the host.
2	Prod Logic Cmd	Current value of the Product Specific Logic Command being transmitted to the host by this peripheral.
3	Reference	Current value of the Product Specific Reference being transmitted to the host by this peripheral.
4	Common Logic Sts	Current value of the Common Logic Status being received from the host by this peripheral.
5	Prod Logic Sts	Current value of the Product Specific Logic Status being received from the host by this peripheral.
6	Feedback	Current value of the Product Specific Feedback being received from the host by this peripheral.
7	Datalink A1 In	Current value of Datalink A1 In being transmitted to the host by this peripheral (if not using Datalink A1, this parameter should have a value of zero).
8	Datalink A2 In	Current value of Datalink A2 In being transmitted to the host by this peripheral (if not using Datalink A2, this parameter should have a value of zero).
9	Datalink B1 In	Current value of Datalink B1 In being transmitted to the host by this peripheral (if not using Datalink B1, this parameter should have a value of zero).
10	Datalink B2 In	Current value of Datalink B2 In being transmitted to the host by this peripheral (if not using Datalink B2, this parameter should have a value of zero).
11	Datalink C1 In	Current value of Datalink C1 In being transmitted to the host by this peripheral (if not using Datalink C1, this parameter should have a value of zero).
12	Datalink C2 In	Current value of Datalink C2 In being transmitted to the host by this peripheral (if not using Datalink C2, this parameter should have a value of zero).
13	Datalink D1 In	Current value of Datalink D1 In being transmitted to the host by this peripheral (if not using Datalink D1, this parameter should have a value of zero).
14	Datalink D2 In	Current value of Datalink D2 In being transmitted to the host by this peripheral (if not using Datalink D2, this parameter should have a value of zero).
15	Datalink A1 Out	Current value of Datalink A1 being received from the host by this peripheral.
16	Datalink A2 Out	Current value of Datalink A2 being received from the host by this peripheral.
17	Datalink B1 Out	Current value of Datalink B1 being received from the host by this peripheral.
18	Datalink B2 Out	Current value of Datalink B2 being received from the host by this peripheral.
19	Datalink C1 Out	Current value of Datalink C1 being received from the host by this peripheral.
20	Datalink C2 Out	Current value of Datalink C2 being received from the host by this peripheral.
21	Datalink D1 Out	Current value of Datalink D1 being received from the host by this peripheral.
22	Datalink D2 Out	Current value of Datalink D2 being received from the host by this peripheral.
23	Field Flash Cnt	Current value of the Field Flash Counter.
24	DPI Rx Errors	Current value of the DPI CAN Transmit Error Counter register.
25	DPI Tx Errors	Maximum value of the DPI CAN Transmit Error Counter register.
26	Reserved	

No.	Name	Description
27	Reserved	
28	DIP Switch 0	Active DIP switch states: Bit 0 DIP SW 1 state 0 = open (off), 1 = closed (on) Bit 1 DIP SW 2 state 0 = open (off), 1 = closed (on) Bit 2 DIP SW 3 state 0 = open (off), 1 = closed (on) Bit 3 DIP SW 4 state 0 = open (off), 1 = closed (on) Bit 4 DIP SW 5 state 0 = open (off), 1 = closed (on) Bit 5 DIP SW 6 state 0 = open (off), 1 = closed (on) Note: Bit 5 always = 0 since SW6 is not connected. Bit 6 DIP SW 7 state 0 = open (off), 1 = closed (on) Bit 7 DIP SW 8 state 0 = open (off), 1 = closed (on) DIP switch changes do not become active until the next time the module is reset.
29	Rack Address Switch	The current setting of the Rack Address rotary switch.

Viewing and Clearing Events

The Remote I/O adapter maintains an event queue that reports the history of its actions. You can view the event queue using an LCD PowerFlex HIM, DriveExplorer (2.01 or higher) software, or DriveTools 2000 (1.01 or higher) software.

Viewing and Clearing Events

Step	Keys	Example Screen
Viewing Events 1. Access parameters in the Adapter. Refer to Using the PowerFlex HIM in Chapter 3.		Main Menu: Diagnostics Parameter Device Select
2. Press the Up Arrow or Down Arrow to scroll to **Diagnostics**.		
3. Press Enter to display the Diagnostics menu in the adapter.		
4. Repeat steps 2 and 3 to enter the **Events** option and then **View Event Queue** option.		
5. Press the Up Arrow or Down Arrow to scroll through the events. The most recent event is Event 1.		EvntQ#01: E#08 Online at 125kbps 00:00:30
Clearing Events 1. Access parameters in the Adapter. Refer to Using the PowerFlex HIM in Chapter 3.		
2. Press the Up Arrow or Down Arrow to scroll to **Diagnostics**.		
3. Press Enter to display the Diagnostics menu in the adapter.		
4. Repeat steps 2 and 3 to enter the **Events** option and then the **Clr Event** option or **Clear Event Queue** option. A message will pop up to confirm that you want to clear the event or queue.		Diag: Events View Queue Clear Event Clear Event Queue
5. Press Enter to clear all events out of the event queue. All event queue entries will then display “No Event.”		

Events

Many events in the Event queue occur under normal operation. If you encounter unexpected communications problems, the events may help you or Allen-Bradley personnel troubleshoot the problem. The following events may appear in the event queue:

Code	Event	Description
1	No Event	Empty event queue entry.
2	DPI Bus Off Flt	A bus-off condition was detected on DPI. This event may be caused by loose or broken cables or by noise.
3	Ping Time Flt	A ping message was not received on DPI within the specified time.
4	Port ID Flt	The adapter is not connected to a correct port on a DPI product.
5	Port Change Flt	The DPI port changed.
6	Host Sent Reset	The DPI product issued this because it was reset.
7	EEPROM Sum Flt	The EEPROM in the adapter is corrupt.
8	Online @ 125kbps	The adapter and DPI product are communicating at 125kbps.
9	Online @ 500kBps	The adapter and DPI product are communicating at 500kbps.
10	Bad Host Flt	The adapter was connected to an incompatible product.
11	Dup. Port Flt	Another peripheral with the same port number is already in use.
12	Type 0 Login	The adapter has logged in for type 0 control.
13	Type 0 Time Flt	The adapter has not received a type 0 status message within the specified time.
14	DL Login	The adapter has logged into a Datalink.
15	DL Reject Flt	The host rejected an attempt to log in to a Datalink because the Datalink is not supported or is used by another peripheral.
16	DL Time Flt	The adapter has not received a Datalink message within the specified time.
17	Control Disabled	The adapter has sent a “Soft Control Disable” command to the DPI product.
18	Control Enabled	The adapter has sent a “Soft Control Enable” command to the DPI product.
19	Reserved	
20	Normal Startup	The adapter successfully started up.
21	Message Timeout	A Client-Server message sent by the peripheral was not completed.
22	DPI Fault Msg	The DPI Host has faulted.
23-27	Reserved	
28	DPI Fault Clear	The DPI product issued this because a fault was cleared.
29	Reserved	
30	NET Comm Flt	The adapter detected a fault condition on the network.
31	NET Sent Reset	The controller issued a reset command to the adapter.
32	NET Idle Flt	The adapter detected an idle condition on the network.
33	NET Timeout Flt	The adapter detected a timeout on the network.
34	Flt Cfg Error	Fault configuration error.
35	Reserved	
36	Manual Reset	The module was reset by the user.
37	Language CRC Bad	The language text memory segment is corrupt.

Notes:

Specifications

Appendix A provides the specifications for the Remote I/O adapter.

Topic	Page
Communications	A-1
Electrical	A-1
Mechanical	A-1

Topic	Page
Environmental	A-2
Regulatory Compliance	A-2

Communications

Network Protocol Network Baud Rate	 Allen-Bradley Remote I/O 57.6K, 115.2K, 230.4K Available baud rates depend on the length of the Remote I/O cable. Refer to Selecting Remote I/O Cables in Chapter 2 for more information.
Drive Protocol Data Rates	 DPI 125K, 500K

Electrical

Consumption	250 mA at 5 V supplied through the drive. All power is received via the connected drive.

Mechanical

Dimensions Height Length Width	 19 mm (0.75 inches) 86 mm (3.39 inches) 78.5 mm (3.09 inches)
Weight	85g (3 oz)

Environmental

Temperature Operating Storage	 -10 to 50°C (14 to 149°F) -40 to +85°C (-40 to 185°F)
Relative Humidity	5 to 95% non-condensing
Atmosphere	**Important:** Adapter **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the adapter is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.

Regulatory Compliance

UL	508C and CUL
CE(1)	EN61800-3

(1) The PowerFlex 70 passes Second Environment/Industrial. If First Environment/Restricted is needed for radiated emissions, then a ferrite core (Fair-Rite PN 2643102002 or equivalent) must be added to the Remote I/O cable. The PowerFlex 700 passes First and Second Environment without the ferrite core.

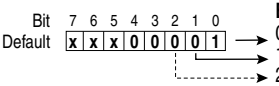
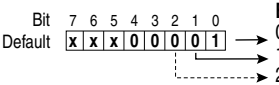
Adapter Parameters

Appendix B provides information about the Remote I/O adapter parameters.

Parameter List

Parameter No	Name and Description	Details	
01	**[DPI Port]** Port to which the adapter is connected. This will usually be port 5.	Default: Minimum: Maximum: Type:	0 0 7 Read Only
02	**[DPI Data Rate]** Data rate used by the PowerFlex drive. This data rate is set using a parameter in the drive, and the adapter autobauds to it.	Default: Values: Type:	0 0 = 125 kbps 1 = 500 kbps Read Only
03	**[RIO Addr Cfg]** Remote I/O rack address (displayed as a decimal value) if hardware switches have been disabled. The hardware switches are disabled by setting DIP switches 7 and 8 to On.	Default: Minimum: Maximum: Type: Reset Required:	1 0 63 decimal Read/Write Yes
04	**[RIO Addr Actual]** Remote I/O rack address (displayed as a decimal value) actually used by the adapter.	Default: Minimum: Maximum: Type:	1 0 63 decimal Read Only
05	**[RIO Rate Cfg]** Remote I/O baud rate if the hardware switches have been disabled. The hardware switches are disabled by setting DIP switches 7 and 8 to On.	Default: Values: Type: Reset Required:	0 = 57.6 K Baud 0 = 57.6 K Baud 1 = 115.2 K Baud 2 = 230.4 K Baud Read/Write Yes
06	**[RIO Rate Actual]** Remote I/O baud rate actually used by the adapter.	Default: Values: Type:	0 = 57.6 K Baud 0 = 57.6 K Baud 1 = 115.2 K Baud 2 = 230.4 K Baud Read Only
07	**[Ref/Fdbk Size]** Size of the Reference/Feedback. The PowerFlex drive determines the size of the Reference/ Feedback.	Default: Value: Type:	0 = 16-bit 0 = 16-bit 1 = 32-bit Read Only
08	**[Datalink Size]** Size of each Datalink word. The PowerFlex drive determines the size of Datalinks.	Default: Values: Type:	0 = 16-bit 0 = 16-bit 1 = 32-bit Read Only

Parameter No	Name and Description	Details
09	**[Reset Module]** No action if set to "Ready." Resets the adapter if set to "Reset Module." Restores the adapter to its factory default settings if set to "Set Defaults." This parameter is a command. It will be reset to "0 = Ready" after a "Reset Module" command or "Set Defaults" command has been performed.	Default: 0 = Ready Values 0 = Ready 1 = Reset Module 2 = Set Defaults Type: Read/Write Reset Required: No
	ATTENTION: Risk of injury or equipment damage exists. If the adapter is transmitting I/O that controls the drive, the drive may fault when you reset the adapter. Determine how your drive will respond before resetting a connected adapter.	
10	**[Comm Flt Action]** Action that the adapter and PowerFlex drive take if the adapter detects that Remote I/O communications have been disrupted. This setting is effective only if I/O that controls the drive is transmitted through the adapter.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 10 - [Comm Flt Action]** lets you determine the action of the adapter and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a hazard of injury or equipment damage.	
11	**[Idle Flt Action]** Action that the adapter and drive take if the adapter detects that the controller is idle because it was switched to program mode. This setting is effective only if I/O that controls the drive is transmitted through the adapter.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 11 - [Idle Flt Action]** lets you determine the action of the adapter and connected drive if the scanner is idle. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a hazard of injury or equipment damage.	

Parameter No	Name and Description	Details
12	**[DPI I/O Config]** I/O that is transferred through the adapter.  	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read/Write Reset Required: Yes **Bit Definitions** 0 = Cmd/Ref 1 = Datalink A 2 = Datalink B 3 = Datalink C 4 = Datalink D 5 = Not Used 6 = Not Used 7 = Not Used
13	**[DPI I/O Active]** I/O that the adapter is actively transmitting. This value is the same as Parameter 12 - [DPI I/O Config] unless the parameter was changed and the adapter was not reset.  	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read Only **Bit Definitions** 0 = Cmd/Ref 1 = Datalink A 2 = Datalink B 3 = Datalink C 4 = Datalink D 5 = Not Used 6 = Not Used 7 = Not Used
14	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if any of the following is true: • Parameter 10 - [Comm Flt Action] is set to Send Flt Cfg and communications are disrupted. • Parameter 11 - [Idle Flt Action] is set to Send Flt Cfg and the scanner is put into Program mode. The bit definitions will depend on the product to which the adapter is connected.	Default: 0000 0000 0000 0000 Minimum: 0000 0000 0000 0000 Maximum: 1111 1111 1111 1111 Type: Read/Write Reset Required: No
15	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if any of the following is true: • Parameter 10 - [Comm Flt Action] is set to Send Flt Cfg and communications are disrupted. • Parameter 11 - [Idle Flt Action] is set to Send Flt Cfg and the scanner is put into Program mode. Parameter 07 - [Ref/Fdbk Size] displays whether the size of the Reference in the drive is 16-bit or 32-bit.	Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read/Write Reset Required: No **Important:** If the drive uses a 16-bit Reference, the most significant word of the value must be set to zero (0) or a fault will occur.

Parameter No	Name and Description	Details
16 17 18 19 20 21 22 23	**[Flt Cfg A1]** **[Flt Cfg A2]** **[Flt Cfg B1]** **[Flt Cfg B2]** **[Flt Cfg C1]** **[Flt Cfg C2]** **[Flt Cfg D1]** **[Flt Cfg D2]** Sets the data that is sent to the Datalink in the drive if any of the following is true: • Parameter 11 - [Idle Flt Action] is set to Send Flt Cfg and the scanner is put into Program mode. • Parameter 10 - [Comm Flt Action] is set to Send Flt Cfg and communications are disrupted. Parameter 08 - [Datalink Size] displays whether the size of Datalinks in the drive is 16-bit or 32-bit.	Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read/Write Reset Required: No **Important:** If the drive uses 16-bit Datalinks, the most significant word of the value must be set to zero (0) or a fault will occur.
24	**[Switches]** Status of the switches. By default, switches are “enabled,” and the adapter is configured based on their settings. If both SW 7 and SW 8 are On, switches are “disabled” and the adapter is configured with values in parameters 3, 5, 25, 26, and 27.	Default: 0 = Disabled Values: 0 = Disabled 1 = Enabled Type: Read Only
25	**[Start RIO Group]** Remote I/O starting module group if the hardware switches have been disabled. The hardware switches are disabled by setting DIP switches 7 and 8 to On.	Default: 0 = Group 0 Values: 0 = Group 0 1 = Group 2 2 = Group 4 3 = Group 6 (allowed for 1/4 rack only) Type: Read/Write Reset Required: Yes
26	**[Last RIO Rack]** Last (or not last) physical group witin a rack address on a Remote I/O network if the hardware switches have been disabled. The hardware switches are disabled by setting DIP switches 7 and 8 to On. Set this parameter to 1 = Enabled to indicate that a drive is the last rack.	Default: 0 = Disabled Values: 0 = Disabled 1 = Enabled Type: Read/Write Reset Required: Yes
27	**[Rack Size]** Rack size if the hardware switches have been disabled. The hardware switches are disabled by setting DIP switches 7 and 8 to On.	Default: 0 = 1/4 rack Values: 0 = 1/4 rack 1 = 1/2 rack Type: Read/Write Reset Required: Yes

CIP Objects

Appendix C presents information about the CIP (Control & Information Protocol) Objects that can be accessed for Block Transfer messages. For information on the format of Block Transfer messages and example ladder logic programs, refer to Chapter 5, Using Block Transfer Messaging.

Topic	Page
CIP Services	C-1
Common Messages	C-2
DPI Device Object	C-4
DPI Parameter Object	C-7
DPI Fault Object	C-17
DPI Alarm Object	C-19
DPI Time Object	C-21

CIP Services

The following CIP services work with most objects in this appendix.

Service Name	Service Code		Description
	Hexadecimal	Decimal	
Get Attribute Single	0x0E	14	Read a single attribute
Set Attribute Single	0x10	16	Write to a single attribute

Common Messages

The following table lists messages that are commonly used to view and edit information in a device. Other messages can be sent using the values within each object listed.

All values are in decimal.

Message	Service	Class	Instance	Attribute	Page
Device Properties					
Clear Run Time Accumulator (Value to send = 1)	14	155	0	4	C-21
Load stored values (Value to send = 2)	16	147	0	2	C-7
Load default values (Value to send = 3)	16	147	0	2	C-7
Read Product Family ID	14	146	0	0	C-4
Read Product Family Name	14	146	0	1	C-4
Read Real Time Clock Data	14	155	1	0	C-22
Read Reference Time Stamp Data					
Read Run Time Accumulator	14	155	timer #	2	C-22
Read User Text String	14	146	0	5	C-4
Store values to NVS (Value to send = 1)	16	147	0	2	C-7
Write Real Time Clock Data	16	155	1	2	C-22
Write User Text String	16	146	0	5	C-4
Parameters					
Read Parameter Full	14	147	Param. #	7	C-8
Read Parameter Value	14	147	Param. #	9 = NVS 10 = RAM	C-8
Read Scattered Parameter Value	75	147	0	0	C-8
Write Parameter Values	16	147	Param #	9 = NVS 10 = RAM	C-8
Write Scattered Parameter Values	76	147	0	0	C-8
Links					
Clear All Links (Value to send = 1)	16	147	0	9	C-7
Clear Parameter Link (Value to send = 0)	16	147	Param. #	11	C-8
Read Parameter Link	14	147	Param. #	11	C-8
Read Scattered Parameter Links	75	147	Param. #s	11	C-8
Write Parameter LInk	16	147	Param. #	11	C-8
Write Scattered Parameter Link	76	147	Param. #s	11	C-8

Common Messages *(Continued)*

All values are in decimal.

Message	Service	Class	Instance	Attribute	Page
Faults/Event					
Clear Fault/Event (Value to send = 1)	16	151	0	3	C-17
Clear Fault/Event Queue (Value to send = 2)	16	151	0	3	C-17
Read Fault/Event	14	151	Fault #	1	C-18
Read Fault/Event Full	14	151	Fault #	0	C-18
Read Fault/Event Queue Size	14	151	0	2	C-17
Read Number of Entries in Queue	14	151	0	6	C-17
Read Trip Fault Queue Number	14	151	0	4	C-17
Reset Device (Value to send = 3)	16	151	0	3	C-17
Alarms					
Clear Alarm (Value to send = 1)	16	152	0	3	C-19
Clear Alarm Queue (Value to send = 2)	16	152	0	3	C-19
Read Alarm	14	152	Alarm #	1	C-20
Read Alarm Full	14	152	Alarm #	0	C-20
Read Number of Entries in Queue	14	152	0	5	C-19
Read Alarm Queue Size	14	152	0	2	C-19

DPI Device Object

Class Code

Hexadecimal	Decimal
0x92	146

Instances

The number of instances depends on the number of components in the device. The number of components can be read in Instance 0, Attribute 4.

Number	Description
0	Class Attributes (Entire Device)
1	Component 1
2	Component 2
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Read Only	Family Code	BYTE	0x00 = Communications Adapter 0x30 = PowerFlex 70 0x38 = PowerFlex 700 0x40 = PowerFlex 7000 0xFF = HIM
1	Read Only	Family Text	STRING[16]	Text identifying the device.
2	Read/ Write	Language Code	BYTE	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch
3	Read Only	Product Series	BYTE	1 = A 2 = B …
4	Read Only	Number of Components	BYTE	Number of components (e.g., main control board, I/O boards) in the device.
5	Read/ Write	User Definable Text	STRING[16]	Text identifying the device with a user-supplied name
6	Read Only	Status Text	STRING[12]	Text describing the status of the drive.

DPI Device Object *(Continued)*

Class Attributes (Continued)

Attribute ID	Access Rule	Name	Data Type	Description
7	Read Only	Configuration Code	BYTE	Identification of variations within a family code.
8	Read Only	Configuration Text	STRING[16]	Text identifying a variation of a family device.
9	Read Only	Brand Code	WORD	0x0001 = Allen-Bradley
11	Read Only	NVS Checksum	WORD	Checksum of the Non-Volatile Storage in a device.
12	Read Only	Class Revision	WORD	Revision of this object.
13	Read Only	Character Set Code	BYTE	0 = SCANport character set 1 = ISO 8859-1 (Latin 1) 2 = ISO 8859-2 (Latin 2) 3 = ISO 8859-3 (Latin 3) 4 = ISO 8859-4 (Latin 4) 5 = ISO 8859-5 (Cyrillic) 6 = ISO 8859-6 (Arabic) 7 = ISO 8859-7 (Greek) 8 = ISO 8859-8 (Hebrew) 9 = ISO 8859-9 (Turkish) 10 = ISO 8859-10 (Nordic) 255 = ISO 10646 (Unicode)
15	Read Only	Languages Supported	STRUCT of BYTE BYTE[n]	 Number of Languages Language Codes (See Class Attribute 2)
16	Read Only	Date of Manufacture	STRUCT of WORD BYTE BYTE	 Year Month Day
17	Read Only	Product Revision	STRUCT of BYTE BYTE	 Major Firmware Release Minor Firmware Release
18	Read Only	Serial Number	DWORD	Value between 0x00 and 0xFFFFFFFF
19	Read/ Write	Language Selected	BYTE	0 = Default (HIM will prompt at start up) 1 = Language was selected (no prompt)
20	Read/ Write	Customer-Generated Firmware	STRING[36]	GUID (Globally Unique Identifier) identifying customer firmware flashed into the device.
128	Read Only	Customization Code	WORD	Code identifying the customized device.
129	Read Only	Customization Revision Number	WORD	Revision of the customized device.
130	Read Only	Customization Device Text	STRING[32]	Text identifying the customized device.

DPI Device Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
3	Read Only	Component Name	STRING[32]	Name of the component
4	Read Only	Component Firmware Revision	STRUCT of BYTE BYTE	 Major Revision Minor Revision
5	Read Only	Component Hardware Change Number	BYTE	0 = Not Available
6	Read Only	First Flash Object Instance	WORD	First instance in the Flash Object used for the firmware in the component
7	Read Only	Number of Flash Object Instances	BYTE	Number of instances in the flash object for this component.
8	Read Only	Component Serial Number	DWORD	Value between 0x00 and 0xFFFFFFFF

DPI Parameter Object

Class Code

Hexadecimal	Decimal
0x93	147

Instances

The number of instances depends on the number of parameters in the device. The number of parameters can be read in Instance 0, Attribute 0.

Number	Description
0	Class Attributes
1	Parameter 1 Attributes
2	Parameter 2 Attributes
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Read Only	Number of Instances	WORD	Number of parameters in the device
1	Read/ Write	Write Protect Password	WORD	0 = Password disabled n = Password
2	Write Only	NVS Command Write	BYTE	0 = No Operation 1 = Store values in active memory to NVS 2 = Load values in NVS to active memory 3 = Load default values to active memory
3	Read Only	NVS Parameter Value Checksum	WORD	Checksum of all parameter values in a user set in NVS
4	Read Only	NVS Link Value Checksum	WORD	Checksum of parameter links in a user set in NVS
5	Read Only	First Accessible Parameter	WORD	First parameter available if parameters are protected by passwords. A “0” indicates all parameters are protected.
7	Read Only	Class Revision	WORD	Revision of this object.
8	Read Only	First Parameter Processing Error	WORD	The first parameter that has been written with a value outside of its range. A “0” indicates no errors.
9	Write Only	Link Command	BYTE	0 = No Operation 1 = Clear All Parameter Links (This does not clear links to function blocks.)

DPI Parameter Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
7	Read Only	DPI Online Read Full	STRUCT of BOOL[32] CONTAINER(1) CONTAINER CONTAINER CONTAINER WORD WORD STRING[4] UINT UINT UINT INT BYTE[3] BYTE STRING[16]	 Descriptor (Refer to pages C-9 – C-10) Parameter value Minimum value Maximum value Default value Next parameter Previous parameter Units (e.g., Amp, Hz) Multiplier(2) Divisor (2) Base(2) Offset(2) Link (source of the value) (0 = no link) Always zero (0) Parameter name
8	Read Only	DPI Descriptor	BOOL[32]	Descriptor (Refer to pages C-9 – C-10)
9	Read/ Write	DPI Parameter Value	Various	Parameter value in NVS.(3)
10	Read/ Write	DPI RAM Parameter Value	Various	Parameter value in temporary memory.
11	Read/ Write	DPI Link	BYTE[3]	Link (parameter or function block that is the source of the value) (0 = no link)
12	Read Only	Help Object Instance	WORD	ID for help text for this parameter
13	Read Only	DPI Read Basic	STRUCT of BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER STRING[16] STRING[4]	 Descriptor (Refer to pages C-9 – C-10) Parameter value Minimum value Maximum value Default value Parameter name Units (e.g., Amp, Hz)
14	Read Only	DPI Parameter Name	STRING[16]	Parameter name
15	Read/ Write	DPI Parameter Alias	STRING[16]	Customer supplied parameter name. Only supported by PowerFlex 700S at time of publication.
16	Read Only	Parameter Processing Error	BYTE	0 = No error 1 = Value is less than the minimum 2 = Value is greater than the maximum

(1) A CONTAINER is a 32-bit block of data that contains the data type used by a parameter value. Padding is used in the CONTAINER to ensure that it is always 32-bits.

(2) This value is used in the formulas used to convert the parameter value between display units and internal units. Refer to Formulas for Converting on page C-10.

(3) Do NOT continually write parameter data to NVS. Refer to the attention on page 5-1.

DPI Parameter Object *(Continued)*

Descriptor Bit Definitions

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0). 000 = BYTE used as an array of Boolean 001 = WORD used as an array of Boolean 010 = BYTE (8-bit integer) 011 = WORD (16-bit integer) 100 = DWORD (32-bit integer) 101 = TCHAR (8-bit (not unicode) or 16-bits (unicode)) 110 = REAL (32-bit floating point value) 111 = Use bits 16, 17, 18
1	Data Type (Bit 2)	
2	Data Type (Bit 3)	
3	Sign Type	0 = unsigned 1 = signed
4	Hidden	0 = visible 1 = hidden
5	Not a Link Sink	0 = Parameter can sink a link 1 = Parameter cannot sink a link
6	Not Recallable	0 = Recallable from NVS 1 = Not Recallable from NVS
7	ENUM	0 = No ENUM text 1 = ENUM text
8	Writable	0 = Read only 1 = Read/write
9	Not Writable When Enabled	0 = Writable when enabled (e.g., drive running) 1 = Not writable when enabled
10	Instance	0 = Parameter value is not a reference to another parameter 1 = Parameter value refers to another parameter
11	Reserved	Must be zero
12	Decimal Place (Bit 0)	Number of digits to the right of the decimal point. 0000 = 0 1111 = 15
13	Decimal Place (Bit 1)	
14	Decimal Place (Bit 2)	
15	Decimal Place (Bit 3)	
16	Extended Data Type (Bit 1)	Right bit is least significant bit (16). 000 = Reserved 001 = DWORD used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
17	Extended Data Type (Bit 2)	
18	Extended Data Type (Bit 2)	

DPI Parameter Object *(Continued)*

Descriptor Bit Definitions

Bit	Name	Description
19	Parameter Exists	Used to mark parameters that are not available to network tools.
20	Reserved	Reserved
21	Formula Links	Indicates the Formula Data is derived from other parameters.
22	Access Level (Bit 1)	A 3-bit field used to control access to parameter data.
23	Access Level (BIt 2)	
24	Access Level (Bit 3)	
25	Writable ENUM	ENUM text: 0 = Read Only, 1 = Read/Write
26	Not a Link Source	0 = Parameter can be a source for a link. 1 = Parameter cannot be a source for a link.
27	Enhanced Bit ENUM	Parameter supports enhanced bit ENUMs.
28	Enhanced ENUM	Parameter supports enhanced ENUMs.
29	Reserved	Reserved
30	Reserved	Reserved
31	Reserved	Reserved

Formulas for Converting

Display Value = ((Internal Value + Offset) x Multiplier x Base) / (Divisor x 10)
Internal Value = ((Display Value x Divisor x 10) / (Multiplier x Base)) - Offset

Object Specific Services

Service Name	Service Code		Description
	Hexadecimal	Decimal	
Get Attributes Scattered	0x4B(1)	75	Read multiple attributes
Set Attributes Scattered	0x4C(1)	76	Write to multiple attributes

(1)Must be directed to Instance 0 and Attribute 0.

DPI Parameter Object *(Continued)*

Format for Get_Attributes_Scattered Service

The structure shown below can get up to eighteen parameters in a single message. In the Response Message, a parameter number with the high bit set indicates that the associated parameter value field actually contains a DPI error code.

		Request (Write Data)		Response (Read Data)	
	Word	High Byte	Low Byte	High Byte	Low Byte
	0	0x00	Length (Bytes)	0x00	Length (Bytes)
	1	DPI Port #	0x81	Status Code	Status Size
	2	0x00	CIP Service	Status Information	
	3	Class		Parameter Number	
	4	Instance		Parameter Value LSW	
	5	Attribute		Parameter Value MSW	
	6	Parameter Number		Parameter Number	
	7	Pad Word		Parameter Value LSW	
	8	Pad Word		Parameter Value MSW	
	9	Parameter Number		Parameter Number	
	10	Pad Word		Parameter Value LSW	
	11	Pad Word		Parameter Value MSW	
	12	Parameter Number		Parameter Number	
	13	Pad Word		Parameter Value LSW	
	14	Pad Word		Parameter Value MSW	
	15	Parameter Number		Parameter Number	
	16	Pad Word		Parameter Value LSW	
	17	Pad Word		Parameter Value MSW	
20 word BT	18	Parameter Number		Parameter Number	
	19	Pad Word		Parameter Value LSW	
	20	Pad Word		Parameter Value MSW	
	21	Parameter Number		Parameter Number	
	22	Pad Word		Parameter Value LSW	
	23	Pad Word		Parameter Value MSW	
	24	Parameter Number		Parameter Number	
	25	Pad Word		Parameter Value LSW	
	26	Pad Word		Parameter Value MSW	
30 word BT	27	Parameter Number		Parameter Number	
	28	Pad Word		Parameter Value LSW	
	29	Pad Word		Parameter Value MSW	

DPI Parameter Object *(Continued)*

	Request (Write Data)		Response (Read Data)	
Word	High Byte	Low Byte	High Byte	Low Byte
30	Parameter Number		Parameter Number	
31	Pad Word		Parameter Value LSW	
32	Pad Word		Parameter Value MSW	
33	Pad Word		Parameter Number	
34	Pad Word		Parameter Value MSW	
35	Parameter Number		Parameter Number	
36	Pad Word		Parameter Value LSW	
37	Pad Word		Parameter Value MSW	
38	Parameter Number		Parameter Number	
39	Pad Word		Parameter Value LSW	
40	Pad Word		Parameter Value MSW	
41	Parameter Number		Parameter Number	
42	Pad Word		Parameter Value LSW	
43	Pad Word		Parameter Value MSW	
44	Parameter Number		Parameter Number	
45	Pad Word		Parameter Value LSW	
46	Pad Word		Parameter Value MSW	
47	Parameter Number		Parameter Number	
48	Pad Word		Parameter Value LSW	
49	Pad Word		Parameter Value MSW	
50	Parameter Number		Parameter Number	
51	Pad Word		Parameter Value LSW	
52	Pad Word		Parameter Value MSW	
53	Parameter Number		Parameter Number	
54	Pad Word		Parameter Value LSW	
55	Pad Word		Parameter Value MSW	
56	Parameter Number		Parameter Number	
57	Pad Word		Parameter Value LSW	
58	Pad Word		Parameter Value MSW	
59	Pad Word		Not Used	

60 word BT

DPI Parameter Object *(Continued)*

The data in this example is for a Get_Attributes_Scattered of PowerFlex 70 parameters 1 - [Output Freq], 3 - [Output Current] and 6 - [Output Voltage] from a device at node address 1.

Request Data for Get_Attributes_Scattered

Address	Value (hex)	Description	Refer to . . .
N30:0	001C	Length = 28 bytes (1C hex)	5-3
N30:1	0081	Port = 00, 0 x 81	5-3
N30:2	004B	0 x 00, Service = Get_Attributes_Scattered	5-3
N30:3	0093	Class = 93 (DPI Parameter Object)	C-7
N30:4	0000	Instance = Class Attributes (drive)	C-7
N30:5	0000	Attribute (not used for this service)	C-7
N30:6	0001	Parameter Number 1	
N30:7	0000	Pad Word	
N30:8	0000	Pad Word	
N30:9	0003	Parameter Number 3	
N30:10	0000	Pad Word	
N30:11	0000	Pad Word	
N30:12	0006	Parameter Number 6	
N30:13	0000	Pad Word	
N30:14	0000	Pad Word	

Response Data for Get_Attributes_Scattered

Address	Value (hex)	Description	Refer to . . .
N30:70	0014	Length = 20 bytes (14 hex)	5-4
N30:71	0000	Status Code = 00 (successful transaction)	5-4
		Status Size = 00	5-4
N30:72	0000	Status Information = 0	5-4
N30:73	0001	Parameter Number 1	
N30:74	0258	Value = 600 (258 hex) = 60.0 Hz	
N30:75	0000		
N30:76	0003	Parameter Number 3	
N30:77	0001	Value = 1 (1 hex) = 0.1A	
N30:78	0000		
N30:79	0006	Parameter Number 6	
N30:80	0864	Value = 2148 (864 hex) = 214.8V AC	
N30:81	0000		

DPI Parameter Object *(Continued)*

Format for Set_Attributes_Scattered Service

The structure shown below can set up to eighteen parameters in a single message. In the Response Message, a parameter number with the high bit set indicates that the associated pad word field contains an error code.

	Request (Write Data)		Response (Read Data)	
Word	**High Byte**	**Low Byte**	**High Byte**	**Low Byte**
0	0x00	Length (Bytes)	0x00	Length (Bytes)
1	DPI Port #	0x81	Status Code	Status Size
2	0x00	CIP Service	Status Information	
3	Class		Parameter Number	
4	Instance		Pad Word or Error Code	
5	Attribute		Pad Word	
6	Parameter Number		Parameter Number	
7	Parameter Value LSW		Pad Word or Error Code	
8	Parameter Value MSW		Pad Word	
9	Parameter Number		Parameter Number	
10	Parameter Value LSW		Pad Word or Error Code	
11	Parameter Value MSW		Pad Word	
12	Parameter Number		Parameter Number	
13	Parameter Value LSW		Pad Word or Error Code	
14	Parameter Value MSW		Pad Word	
15	Parameter Number		Parameter Number	
16	Parameter Value LSW		Pad Word or Error Code	
17	Parameter Value MSW		Pad Word	
18	Parameter Number		Parameter Number	
19	Parameter Value LSW		Pad Word or Error Code	
20	Parameter Value MSW		Pad Word	
21	Parameter Number		Parameter Number	
22	Parameter Value LSW		Pad Word or Error Code	
23	Parameter Value MSW		Pad Word	
24	Parameter Number		Parameter Number	
25	Parameter Value LSW		Pad Word or Error Code	
26	Parameter Value MSW		Pad Word	
27	Parameter Number		Parameter Number	
28	Parameter Value LSW		Pad Word or Error Code	
29	Parameter Value MSW		Pad Word	

20 word BT

30 word BT

DPI Parameter Object *(Continued)*

	Request (Write Data)		Response (Read Data)	
Word	**High Byte**	**Low Byte**	**High Byte**	**Low Byte**
30	Parameter Number		Parameter Number	
31	Parameter Value LSW		Pad Word or Error Code	
32	Parameter Value MSW		Pad Word	
33	Parameter Number		Parameter Number	
34	Parameter Value LSW		Pad Word or Error Code	
35	Parameter Value MSW		Pad Word	
36	Parameter Number		Parameter Number	
37	Parameter Value LSW		Pad Word or Error Code	
38	Parameter Value MSW		Pad Word	
39	Parameter Number		Parameter Number	
40	Parameter Value LSW		Pad Word or Error Code	
41	Parameter Value MSW		Pad Word	
42	Parameter Number		Parameter Number	
43	Parameter Value LSW		Pad Word or Error Code	
44	Parameter Value MSW		Pad Word	
45	Parameter Number		Parameter Number	
46	Parameter Value LSW		Pad Word or Error Code	
47	Parameter Value MSW		Pad Word	
48	Parameter Number		Parameter Number	
49	Parameter Value LSW		Pad Word or Error Code	
50	Parameter Value MSW		Pad Word	
51	Parameter Number		Parameter Number	
52	Parameter Value LSW		Pad Word or Error Code	
53	Parameter Value MSW		Pad Word	
54	Parameter Number		Parameter Number	
55	Parameter Value LSW		Pad Word or Error Code	
56	Parameter Value MSW		Parameter Number	
57	Parameter Number		Pad Word or Error Coder	
58	Parameter Value LSW		Pad Word	
59	Parameter Value MSW		Not Used	

60 word BT

DPI Parameter Object *(Continued)*

The data in this example is for a Set_Attributes_Scattered of PowerFlex 70 parameters 140 - [Accel Time 1], 142 - [Decel Time 1] and 100 - [Jog Speed] to a device at node address 1.

Request Data for Set_Attributes_Scattered

Address	Value (hex)	Description	Refer to . . .
N30:0	001C	Length = 28 bytes (1C hex)	5-3
N30:1	0081	Port = 00, 0 x 81	5-3
N30:2	004C	0 x 00, Service = Set_Attributes_Scattered	5-3
N30:3	0093	Class = 93 (DPI Parameter Object)	C-7
N30:4	0000	Instance = Class Attributes (drive)	C-7
N30:5	0000	Attribute (not used for this service)	C-7
N30:6	008C	Parameter Number 140 (8C hex)	
N30:7	0032	Value = 50 (32 hex) = 5.0 seconds	
N30:8	0000		
N30:9	008E	Parameter Number 142 (8E hex)	
N30:10	0032	Value = 50 (32 hex) = 5.0 seconds	
N30:11	0000		
N30:12	0064	Parameter Number 100 (64 hex)	
N30:13	0064	Value = 100 (64 hex) = 10.0 Hz	
N30:14	0000		

Response Data for Set_Attributes_Scattered

Address	Value (hex)	Description	Refer to . . .
N30:70	0014	Length = 20 bytes (14 hex)	5-4
N30:71	0000	Status Code = 00 (successful transaction)	5-4
		Status Size = 00	5-4
N30:72	0000	Status Information = 0	5-4
N30:73	008C	Parameter Number 140 (8C hex)	
N30:74	0000	No Error	
N30:75	0000		
N30:76	008E	Parameter Number 142 (8E hex)	
N30:77	0000	No Error	
N30:78	0000		
N30:79	0064	Parameter Number 100 (64 hex)	
N30:80	0000	No Error	
N30:81	0000		

DPI Fault Object

Class Code

Hexadecimal	Decimal
0x97	151

Products such as PowerFlex drives use this object for faults. Adapters use this object for events.

Instances

The number of instances depends on the maximum number of faults or events supported in the queue. The maximum number of faults/events can be read in Instance 0, Attribute 2.

Number	Description
0	Class Attributes
1	Most Recent Fault/Event
2	Second Most Recent Fault/Event
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Read Only	Class Revision	WORD	Revision of object
2	Read Only	Number of Instances	WORD	Maximum number of faults/events that the device can record in its queue
3	Write	Fault Command Write	BYTE	0 = No Operation 1 = Clear Fault/Event 2 = Clear Fault/Event Queue 3 = Reset Device
4	Read Only	Fault Trip Instance Read	WORD	Fault that tripped the device. For adapters, this value is always 1 when faulted.
5	Read Only	Fault Data List	STRUCT of BYTE BYTE WORD[n]	Reserved
6	Read Only	Number of Recorded Faults	WORD	Number of faults/events in the queue. A “0” indicates the fault queue is empty.
7	Read Only	Fault Parameter Reference	WORD	Reserved

DPI Fault Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Read Only	Full/All Information	STRUCT of WORD STRUCT of BYTE BYTE STRING[16] STRUCT of LWORD BOOL[16] WORD CONTAINER[n]	 Fault code Fault source DPI port DPI Device Object Fault text Fault time stamp Timer value (0 = Timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2 - 15]: Not used Reserved Reserved
1	Read Only	Basic Information	STRUCT of WORD STRUCT of BYTE BYTE STRUCT of LWORD BOOL[16]	 Fault code Fault source DPI port DPI Device Object Fault time stamp Timer value (0 = Timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2 - 15]: Not used

DPI Alarm Object

Class Code

Hexadecimal	Decimal
0x98	152

Products such as PowerFlex drives use this object for alarms or warnings. Adapters do not support this object.

Instances

The number of instances depends on the maximum number of alarms supported by the queue. The number of alarms can be read in Instance 0, Attribute 2.

Number	Description
0	Class Attributes
1	Most Recent Alarm
2	Second Most Recent Alarm
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Read Only	Class Revision	WORD	Revision of object
2	Read Only	Number of Instances	WORD	Maximum number of alarms that the device can record in its queue
3	Write	Alarm Command Write	BYTE	0 = No Operation 1 = Clear Alarm 2 = Clear Alarm Queue 3 = Reset Device
4	Read Only	Fault Data List	STRUCT of BYTE BYTE WORD[n]	Reserved
5	Read Only	Number of Recorded Alarms	WORD	Number of alarms in the queue. A “0” indicates the alarm queue is empty.

DPI Alarm Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Read Only	Full/All Information	STRUCT of WORD STRUCT of BYTE BYTE STRING[16] STRUCT of LWORD BOOL[16] WORD CONTAINER[n]	 Alarm code Alarm source DPI port DPI Device Object Alarm text Alarm time stamp Timer value (0 = Timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2 - 15] Reserved Reserved Reserved
1	Read Only	Basic Information	STRUCT of WORD STRUCT of BYTE BYTE STRUCT of LWORD BOOL[16]	 Alarm code Alarm source DPI port DPI Device Object Alarm time stamp Timer value (0 = Timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2 - 15] Reserved

DPI Time Object

Class Code

Hexadecimal	Decimal
0x9B	155

Instances

The number of instances depends on the number of timers in the device. Instance 1 is always reserved for a real time clock although a device may not support it. Number of timers can be read in Instance 0, Attribute 2.

Number	Description
0	Class Attributes
1	Real Time Clock (Predefined) (Not always supported)
2	Timer 1
3	Timer 2
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Read Only	Class Revision	WORD	Revision of object
2	Read Only	Number of Instances	WORD	Number of timers in the object, excluding the real time clock that is predefined.
3	Read Only	First Device Specific Timer	WORD	Instance of the first timer that is not predefined.
4	Write	Time Command Write	BYTE	0 = No Operation 1 = Clear all timers (Does not clear the real time clock or read only timers)

DPI Time Object *(Continued)*

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Read Only	Read Full	STRUCT of STRING[16] LWORD or STRUCT BOOL[16]	 Name of the timer Elapsed time in milliseconds unless timer is a real time clock (See attribute 2) See Attribute 3
1	Read Only	Timer Text	STRING[16]	Name of the timer
2	Read/ Write	Timer Value	LWORD -OR- STRUCT of WORD BYTE BYTE BYTE BYTE BYTE BYTE	Elapsed time in milliseconds unless the timer is a real time clock. Real Time Clock Data: Milliseconds (0 – 999) Seconds (0 – 59) Minutes (0 – 59) Hours (0 – 23) Days (1 – 31) Months (1 = January, 12 = December) Years (since 1972)
3	Read Only	Timer Descriptor	BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2 - 15]: Not used

Logic Command/Status Words

Appendix D provides the definitions of the Logic Command/Logic Status words that are used for some products that can be connected to the Remote I/O adapter. If you do not see the Logic Command/Logic Status for the product that you are using, refer to your product's documentation.

PowerFlex 70 and PowerFlex 700 Drives

Logic Command Word

Logic Bits															Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
															x	Stop	0 = Not Stop 1 = Stop*
														x		Start*	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Direction Control
									x							Local Control	0 = No Local Control 1 = Local Control
								x								MOP Increment	0 = Not Increment 1 = Increment
						x	x									Accel Rate	00 = No Command 01 = Accel Rate 1 Command 10 = Accel Rate 2 Command 11 = Hold Accel Rate
				x	x											Decel Rate	00 = No Command 01 = Decel Rate 1 Command 10 = Decel Rate 2 Command 11 = Hold Decel Rate
	x	x	x													Reference Select	000 = No Command 001 = Ref. 1 (Ref A Select) 010 = Ref. 2 (Ref B Select) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
x																MOP Decrement	0 = Not Decrement 1 = Decrement

* A 0 = Not Stop condition (logic 0) must first be present before a 1 = Start condition will start the drive.

PowerFlex 70 and PowerFlex 700 Drives

Logic Status Word

Logic Bits															Status	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
															x	Ready	0 = Not Ready 1 = Ready
														x		Active	0 = Not Running 1 = Running
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm 1 = Alarm
								x								Fault	0 = No Fault 1 = Fault
							x									At Speed	0 = Not At Reference 1 = At Reference
				x	x	x										Local Control	000 = Port 0 (TB) 001 = Port 1 010 = Port 2 011 = Port 3 100 = Port 4 101 = Port 5 110 = Port 6 111 = No Local
x	x	x	x													Reference	0000 = Ref A Auto 0001 = Ref B Auto 0010 = Preset 2 Auto 0011 = Preset 3 Auto 0100 = Preset 4 Auto 0101 = Preset 5 Auto 0110 = Preset 6 Auto 0111 = Preset 7 Auto 1000 = Term Blk Manual 1001 = DPI 1 Manual 1010 = DPI 2 Manual 1011 = DPI 3 Manual 1100 = DPI 4 Manual 1101 = DPI 5 Manual 1110 = DPI 6 Manual 1111 = Jog Ref

A

Adapter

Devices such as drives, controllers, and computers usually require an adapter to provide a communication interface between them and a network such as Remote I/O. An adapter reads data on the network and transmits it to the connected device. It also reads data in the device and transmits it to the network.

The 20-COMM-R Remote I/O adapter is an adapter that connects a PowerFlex drive to a Remote I/O network. Adapters are also called “cards,” “gateways,” “modules,” and “peripherals.”

B

Baud Rate

A unit of signaling speed equal to the number of discrete conditions or signal events per second. Remote I/O networks support baud rates of 57.6K, 115.2K, and 230.4K. The baud rate that you use on a network depends on cable length. Refer to Selecting Remote I/O Cables in Chapter 2 for information on cables.

Block Transfer Messages

A block transfer message is a data transfer mechanism that allows transfers of large amounts of data. The 20-COMM-R Remote I/O adapter uses Block Transfer for two types of data.

Block Transfers that are 18 words or less in length are used to transfer I/O data such as Reference/Feedback and Datalink values. These Block Transfers are often referred to as “Block Transfer I/O.”

Block Transfers that are 20, 30 or 60 words in length are used to transfer Explicit Messages that can access parameters and other data in a DPI device such as a PowerFlex drive. These Block Transfers are often referred to as Block Transfer Messaging. Block Transfer Messaging is often used to read and write several parameters per Explicit Message using the 'Get Attributes Scattered' and 'Set Attributes Scattered' services.

Size in Words	Purpose	Refer To:
18 or fewer	I/O	Chapter 4, Using Discrete & Block Transfer I/O
20, 30, or 60	Explicit Messaging	Chapter 5, Using Block Transfer Messaging

A Block Transfer Read (BTR) is initiated by the controller and contains no data. The target device sends data in response to this request.

A Block Transfer Write (BTW) is initiated by the controller and contains data for the target device. The target device only acknowledges the successful receipt of the data.

C

Client/Server Network

This type of network has a server respond to client requests. For example, the Remote I/O adapter is a server of data and responds to the requests of client devices (for example, controllers).

CIP (Control and Information Protocol)

CIP is the transport and application layer protocol used by some scanners on Remote I/O networks. The control protocol is for I/O. The information protocol is for block transfer messaging (configuration, data collection, and diagnostics).

Controller

A controller, also called programmable logic controller, is a solid-state control system that has a user-programmable memory for storage of instructions to implement specific functions such as I/O control, logic, timing, counting, report generation, communication, arithmetic, and data file manipulation. A controller consists of a central processor, input/output interface, and memory. See also Scanner.

D

Datalinks

A Datalink is a type of mechanism used by some DPI products to transfer data to and from the controller. Datalinks allow a parameter value to be viewed or changed without using explicit block transfer messages. When enabled, each Datalink consumes either two 16-bit or two 32-bit words in both the input and output image table of the controller.

DPI

DPI is a second generation peripheral communication interface based on CAN technology. It is used by the Allen-Bradley PowerFlex family of drives.

DPI Host

A device that uses the DPI communications interface to communicate with one or more peripheral devices. For example, a motor drive such as a PowerFlex drive is a DPI Host.

DPI Peripheral

A device that provides an interface between DPI and a network or user. Peripheral devices are also referred to as “adapters” and “modules.” The serial converter and PowerFlex HIM are examples of DPI peripherals.

DriveExplorer Software

DriveExplorer software is a tool for monitoring and configuring Allen-Bradley products and adapters. It can be run on computers running Microsoft Windows 95, Windows 98, Windows NT (4.0 or higher), and Windows CE (2.0 or higher) operating systems. Information about DriveExplorer software and a free lite version can be accessed at http://www.ab.com/drives/driveexplorer

DriveTools Software

DriveTools software is a tool for monitoring and configuring Allen-Bradley products and adapters. It can be run on computers running Microsoft Windows 95, Windows 98, or Windows NT (4.0 or higher) operating systems. Information about DriveTools software is available at http://www.ab.com/drives.

F

Fault Action

A fault action determines how the adapter and connected product act when there is a communications fault (e.g., a cable is disconnected) or when the scanner is switched out of run mode.

Fault Configuration

When communications are disrupted (for example, a cable is disconnected), the adapter and PowerFlex drive can respond with a user-defined fault configuration. The user sets the data that is sent to the drive in the fault configuration parameters (**Parameters 14 - [Flt Cfg Logic]** through **22 - [Flt Cfg D2]**). When a fault action parameter is set to use the fault configuration and a fault occurs, the data from these parameters is sent as the Command Logic, Reference, and/or Datalink(s).

Flash Update

The process of updating firmware in the adapter. The adapter can be flash updated using the Xmodem protocol and a 1203-SSS Smart Self-powered Serial converter (firmware 3.01 or higher).

H

HIM (Human Interface Module)

A device that can be used to configure and control a PowerFlex drive. New HIMs (20-HIM-x) can be used to configure connected peripherals.

Hold Last

When communications are disrupted (for example, a cable is disconnected), the adapter and PowerFlex drive can respond by holding last. Hold last results in the drive receiving the last data received via the network connection before the disruption. If the drive was running and using the Reference from the adapter, it will continue to run at the same Reference.

I

I/O Data

I/O messages, sometimes called "input/output," transmit time-critical data such as a Logic Command and Reference. The terms "input" and "output" are defined from the scanner's point of view. Output is transmitted by the scanner and consumed by the adapter. Input is transmitted by the adapter and consumed by the scanner.

The Remote I/O adapter supports two types of I/O: Discrete and Block Transfer.

L

Last RIO Rack

The last rack switch and parameter setting will notify a controller that the adapter is the last physical device with its rack address. You must set this switch or parameter to On if a product is the last device with a specific rack address and you are using a PLC-2 controller. We recommend that you set this switch or parameter to On when you are using other controllers.

Logic Command/Logic Status

The Logic Command is used to control the PowerFlex drive (for example, start, stop, direction). It consists of one 16-bit word of input to the adapter from the network. The definitions of the bits in this word depend on the drive.

The Logic Status is used to monitor the PowerFlex drive (for example, operating state, motor direction). It consists of one 16-bit word of output from the adapter to the network. The definitions of the bits in this word depend on the drive.

N

NVS (Non-Volatile Storage)

NVS is the permanent memory of a device. Devices such as the adapter and drive store parameters and other information in NVS so that they are not lost when the device loses power. NVS is sometimes called "EEPROM."

P

PowerFlex Drives

The Allen-Bradley PowerFlex family of drives includes PowerFlex 70, 700 and 7000 drives. These drives can be used for applications ranging from 0.37 kW (0.5 HP) to 3,000 kW (4,000 HP). All PowerFlex drives implement DPI, allowing them to use the 20-COMM-R RIO adapter. This manual focuses on using the adapter with PowerFlex drives. Other products that implement DPI can also use the adapter.

R

Rack Address

Each device on a network must have a rack address that the controller with which it intends to communicate will recognize. A rack address and starting module group are used to identify each device on a Remote I/O network. Although the adapter supports rack address up to 77 Octal, not all controllers recognize all of the addresses and Remote I/O channels can support only 32 devices. Refer to your controller documentation for appropriate addresses. Rack addresses use an octal numbering convention.

Rack Size

The rack size determines the number of 16-bit words of discrete I/O that the Remote I/O adapter sends and receives. The Remote I/O adapter can be configured as 1/4 rack (two 16-bit words) or 1/2 rack (four 16-bit words). Additional I/O can be transferred using the Block Transfer I/O image.

Reference/Feedback

The Reference is used to send a Reference (for example, speed, frequency, torque) to the product. It consists of one word of input to the adapter from the network. The size of the word (either a 16-bit word or 32-bit word) is determined by the drive.

Feedback is used to monitor the speed of a product. It consists of one word of output from the adapter to the network. The size of the word (either a 16-bit word or 32-bit word) is determined by the drive.

Remote I/O Network

Remote I/O is an Allen-Bradley network interface originally designed to link remote I/O racks to PLCs over appropriate cables (“Blue-Hose”). Remote I/O supports remote, time-critical control communications between a client controller and a server devices such as a Remote I/O adapter and connected drive. A server device will accept only the packets that are addressed to it. Remote I/O also supports Block Transfer messaging. Remote I/O networks (sometimes called links) can support up to 32 devices on a channel.

S

Scanner

A scanner is a separate module (of a multi-module controller) or a built-in component (of a single-module controller) that provides communication with adapters connected to a network. See also Controller.

Starting Module Group

The starting module group is the word in a rack at which the group starts. It depends on the rack size. This Remote I/O adapter can be configured as a 1/4 rack, which is two words, or a 1/2 rack, which is 4 words. Adapters configured as 1/4 racks can use starting module groups 0, 2, 4, or 6. Adapters configured as 1/2 racks can use only starting module groups 0, 2, or 4.

Status Indicators

Status indicators are LEDs that are used to report the status of a device. There are three status indicators on the converter.

X

Xmodem

Xmodem is a protocol used to transfer data across serial connections. The Remote I/O firmware uses the Xmodem protocol when you flash update its firmware.

Z

Zero Data

When communications are disrupted (for example, a cable is disconnected), the adapter and drive can respond with zero data. Zero data results in the drive receiving zero as values for command data. If the drive was running and using the Reference from the adapter, it will stay running but at zero Reference.

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